

TC

824

C2

A2

no. 121

c.1

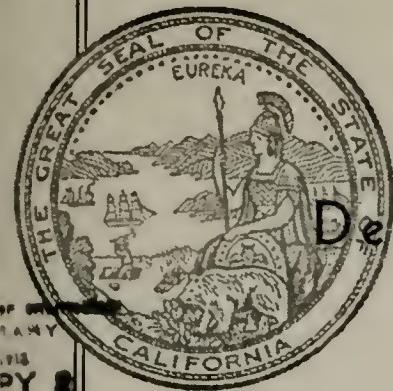
PHY SCI

& ENGR

AL
ES
T

LIBRARY
UNIVERSITY OF CALIFORNIA
DAVIS

DEC 16 1966



State of California
THE RESOURCES AGENCY

Department of Water Resources

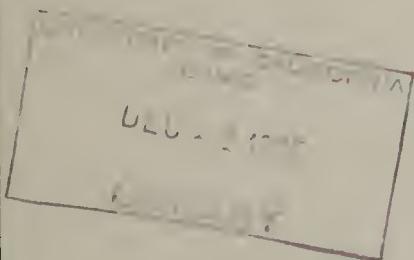
BULLETIN No. 121



SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY

1961

AUGUST 1965



HUGO FISHER
Administrator
The Resources Agency

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources



TABLE OF CONTENTS

	<u>Page</u>
LETTER OF TRANSMITTAL	vii
AUTHORIZATION	viii
ACKNOWLEDGMENT	ix
ORGANIZATION	xi
CHAPTER I. INTRODUCTION	1
Objective and Scope of Investigation	1
Related Investigations and Reports	4
CHAPTER II. AREA OF INVESTIGATION	7
Climatic Conditions	7
Cultural Development	9
Water Supply	12
Hydrographic Units	14
Mono Lake Unit (6-7)	14
Adobe Valley Unit (6-8)	15
Owens River Unit (6-9)	16
Death Valley Unit (6-10)	16
Mojave River Unit (6-11)	17
Antelope Valley Unit (6-12)	17
CHAPTER III. LAND USE	19
Methods and Procedures	19
Classification of Land Use	20
Results of Land Use Survey	24
Present Land Use	24

	<u>Page</u>
Changes in Land Use	28
Mono Lake Unit (6-7)	30
Adobe Valley Unit (6-8)	33
Owens River Unit (6-9)	33
Death Valley Unit (6-10)	33
Northern Death Valley	33
Southern Death Valley	34
Mojave River Unit (6-11)	34
Antelope Valley Unit (6-12)	34
 CHAPTER IV. WATER USE	37
Definition of Water Use	37
Methods of Estimating Water Use	38
Unit Values of Water Use	40
Urban and Suburban Water Use Values	41
Irrigated Agriculture Water Use Values	42
Estimates of 1961 Net Water Use	44
 CHAPTER V. SUMMARY OF FINDINGS AND CONCLUSIONS .	49
Summary of Findings	49
Conclusions	51
 ILLUSTRATIONS	
	<u>Page</u>
Lahontan Desert	Frontispiece
Antelope Valley	2
Owens Valley	8
Open Pit Mining of Borate Ores	25
June Lake	39
Mojave River Valley	50

TABLES

<u>Table No.</u>		<u>Page</u>
1	Population of Principal Urban Centers in Southern Lahontan Area	11
2	Population of Counties or Portions of Counties Within Southern Lahontan Area	11
3	Areas of Hydrographic Units, Southern Lahontan Area	14
4	Factors for Reduction of Gross Areas to Net Water Service Areas	23
5	Land Use in Hydrographic Units of the Southern Lahontan Area in 1961	26
6	Land Use in Counties of the Southern Lahontan Area in 1961	27
7	Land Use in Service Areas of Major Water Agencies of the Southern Lahontan Area in 1961	29
8	Change in Land Use in the Southern Lahontan Area .	31
9	Estimated Mean Seasonal Unit Values of Net Water Use on Urban and Suburban Lands, Southern Lahontan Area	41
10	Estimated Mean Seasonal Unit Values of Consumptive Use of Water on Irrigated Lands, Southern Lahontan Area	43
11	Estimated Levels of Net Water Use in the Southern Lahontan Area for Conditions of Development in 1950, 1957, and 1961	46

APPENDIXES

<u>Appendix</u>		<u>Page</u>
A	Definition of Terms Used in Report	53
B	Land Use in Hydrologic Units, Subunits, and Subareas of the Southern Lahontan Area in 1961 .	59
C	List of Districts, Areas, and Units for Which Individual Tabulations of 1961 Land Uses Are Available	75

PLATES

Plate No.

- 1 Area of Investigation and Hydrographic Units
- 2 Hydrologic Units, Subunits, and Subareas
- 3A Present Land Use
- 3B Present Land Use
- 3C Present Land Use
- 3D Present Land Use
- 4 Change in Land Use - Antelope and Mojave River Valleys
 and Vicinities, 1957 to 1961

ARTMENT OF WATER RESOURCES

OX 388
MENTO

June 16, 1965

Honorable Edmund G. Brown, Governor, and
Members of the Legislature of the
State of California

Gentlemen:

Bulletin No. 121, "Southern Lahontan Area Land and Water Use Survey, 1961", was prepared as a part of the Department of Water Resources' continuing program of studies, pursuant to Sections 225, 226, and 232 of the California Water Code.

Portions of Mono, San Bernardino, Kern, and Los Angeles Counties, and all of Inyo County were surveyed during the investigation. For the northern portion of the area, changes in land and water use since 1950, the year of the previous survey, are evaluated in the report. For the southern portion of the area, changes in land and water use since 1957 are evaluated.

The investigation found that during the 11-year period between 1950 and 1961, the water service area in the northern portion of the study area decreased about 30 percent, and the net water use decreased about 50 percent, or approximately 14,100 acre-feet. In the southern portion of the area, the water service area increased about 64 percent between 1957 and 1961, and the net water use increased about 38,500 acre-feet, or 20 percent.

The increasing need for water in the desert areas of Southern California, coupled with already deficient local water supplies in many localities, points up the need for continued participation by residents of this area in statewide planning and construction of water resources developments.

Sincerely yours,

A handwritten signature in black ink, appearing to read "William E. Warne".

Director

AUTHORIZATION

The California Legislature of 1929 enacted legislation, providing for investigations of the kind reported here, as follows:

"SECTION 1. Out of any money in the State treasury not otherwise appropriated, the sum of four hundred fifty thousand dollars,* or so much thereof as may be necessary, is hereby appropriated to be expended by the State Department of Public Works in accordance with law in conducting work of exploration, investigation and preliminary plans in furtherance of a coordinated plan for the conservation, development, and utilization of the water resources of California including the Santa Ana River and its tributaries, the Mojave River and its tributaries, and all other water resources of Southern California."

(California Statutes of 1929, Chapter 832, Section 1)

Subsequent sessions of the Legislature have appropriated funds for support of programs of the Department of Water Resources. Portions of these funds have been utilized for continuing investigations of the water resources of Southern California in accordance with the legislative intent expressed in the foregoing statute and in Sections 225 and 226 of the California Water Code.

The Department of Water Resources was directed by the Legislature in 1956 to make continuing investigations to develop "information as to water which can be made available for exportation from the watersheds from which it originates without depriving those watersheds of water resources for beneficial uses therein". This legislation specifically requested investigation of and reports on the following matters:

"(a) The boundaries of the respective watersheds of the State and the quantities of water originating therein; (b) The quantities of water reasonably required for ultimate beneficial use in the respective watersheds; (c) The quantities of water, if any, available for export from the respective watersheds;

*Reduced by the Governor to \$390,000.

(d) The areas which can be served by the water available for export from each watershed; and (e) The present uses of water within each watershed together with the apparent claim of water right attaching thereto, excluding individual uses of water involving diversions of small quantities which, in the judgment of the Director of Water Resources, are insufficient in the aggregate to materially affect the quantitative determinations included in the report."

Pursuant to the foregoing legislation, the Department of Water Resources began a program of continuing surveys of land and water use in the water-deficient Southern California area during 1957. Surveys are made in portions of the entire Southern District, so that land and water use are determined at periodic intervals for every area in the District.

ACKNOWLEDGMENT

Valuable assistance and data used in this investigation and report were contributed by public and private agencies. The cooperation and assistance received from these agencies is gratefully acknowledged. Special mention is made of the assistance and cooperation received from the following:

Los Angeles County Director and Farm Advisor

Los Angeles Department of Water and Power

Los Angeles County Engineer's Office

California Division of Highways

Inyo County Administrator

United States Forest Service

California Department of Fish and Game

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

EDMUND G. BROWN, Governor, State of California
HUGO FISHER, Administrator, The Resources Agency
WILLIAM E. WARNE, Director, Department of Water Resources
ALFRED R. GOLZE', Chief Engineer
JOHN M. HALEY, Assistant Chief Engineer

SOUTHERN DISTRICT

James J. Doody District Engineer
Jack J. Coe* Chief, Planning Branch

This bulletin was prepared in the
Water Supply and Utilization Section
under the direction of

Ronald C. Hightower** . . . Chief, Water Supply and Utilization Section

by

Elwood C. Johnson Water Resources Engineering Associate

assisted by

Barry P. Brown Assistant Land and Water Use Analyst
Robert D. Smith Assistant Land and Water Use Analyst
Sumi Minatoya Delineator

*Herbert W. Greydanus was Chief of the Planning Branch until June 30, 1964.

**Donald H. McKillop was Chief of the Water Supply and Utilization Section until November 29, 1963.

CHAPTER I. INTRODUCTION

Water is the essential ingredient that transforms dry wastelands into productive property, useful for agriculture, urban growth, industry, and recreation. Once a practical, economical method of obtaining water is found, agricultural, urban, and industrial growth can take place.

Certain parts of the southern Lahontan area are thus being changed from desert land to productive land, and the resulting influx of population and industry has brought a rapid expansion of the small communities. This is especially true of those communities located close to the large population centers of Southern California.

Recognizing the rapid change that is taking place in land use within the water-deficient areas of Southern California, the State Legislature has authorized the Department of Water Resources to make continuing surveys of land and water use throughout the area. This bulletin is one in a series that presents results of the surveys made during 1961. It gives information on the rate of growth and development and the increasing need for water development in the southern Lahontan area of California under conditions that existed in the summer of 1961.

Objective and Scope of Investigation

The objective of this investigation is to develop information on which present and future water requirements can be established.

Land use information provides basic data from which present water requirements can be computed. A knowledge of historical growth patterns of land use not only permits such computations but, of more importance to the overall planning concept, permits an analysis of the direction and



ANTELOPE VALLEY

Spence Air Photos

Water is the essential ingredient that transforms dry, barren areas
into productive land, useful for such things as agriculture.

magnitude of land use changes taking place from one survey to another. This information, coupled with computations of changes in water use, provides the basis upon which future water requirements are determined, and upon which the planning for importation and distribution systems is carried out. The material presented here is intended for the use of agencies responsible for making the most effective use of existing water supplies and for developing additional supplies to meet current and expected deficiencies.

Present land use was determined from an extensive field survey of the southern Lahontan area of California conducted during the summer of 1961. The area surveyed is shown on Plate 1, "Area of Investigation and Hydrographic Units".

In addition to showing present land use, this report also presents a narration of historical land use development and an estimate of the present levels of water use. Results of previous land use studies conducted for California State Water Resources Board, Bulletin No. 2, "Water Utilization and Requirements of California", June 1955, and California State Department of Water Resources, Bulletin No. 101, "Desert Areas of Southeastern California Land and Water Use Survey, 1958", January 1963, served as the basis for comparison between historical and present land use determinations. Information on local water supplies was obtained from material in the Department's files and from operating agencies in the area of investigation.

Terms used in this report that require clarification are defined at the point where they first occur in the text, and are supplemented by a list of definitions, presented in Appendix A.

Land use information collected by the Department of Water Resources is processed by machine techniques which permit the evaluation of these data in terms of a sizable number of hydrologic, geographic, or political subdivisions with different boundaries. The tabulations in the main body of this report give land use within the boundaries that are thought to be the most generally useful. Additional land use tabulations for hydrologic units, subunits, and subareas are given in Appendix B. The boundaries of these areas are shown on Plate 2, "Hydrologic Units, Subunits, and Subareas". Appendix C contains a list of districts, areas, and units for which individual tabulations of 1961 land uses can be obtained by machine methods, based on data available in the Department's files.

Related Investigations and Reports

The California Legislature of 1947, by Chapter 1541, Statutes of 1947, appropriated funds for predecessor agencies and the Department of Water Resources to conduct a comprehensive investigation of the water resources of the entire State of California. The investigation had as its purpose the preparation of The California Water Plan. Results of the investigation are contained in three publications: California State Water Resources Board Bulletin No. 1, "Water Resources of California", 1951; California State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California", June 1955; and California State Department of Water Resources Bulletin No. 3, "The California Water Plan", May 1957. The investigations for Bulletin No. 2 included a survey of land use and a determination of water utilization in the southern Lahontan area for 1950. More recent land and water use information was published in Bulletin No. 101, entitled "Desert Areas of Southeastern California Land and Water

Use Survey, 1958". This bulletin presents 1957 land and water use data for the Antelope Valley, Southern Death Valley, and Mojave River Hydrographic Units, and 1958 data for the remainder of the southeastern desert area. The 1957 information was used extensively in this bulletin for comparison purposes.

The following reports also contain information pertinent to land and water use within the southern Lahontan area:

Blaney, Harry F. and Ewing, Paul A. "Utilization of the Waters of Mojave River, California." United States Department of Agriculture. August 1935.

California State Department of Engineering. "Report on the Utilization of Mojave River for Irrigation in Victor Valley, California." Bulletin No. 5. 1918.

California State Department of Public Works, Division of Water Resources. "Mojave River Investigation." Bulletin No. 47. 1934.

----. "Report on Senate Committee on Local Governmental Agencies on Water Supply and Use of Water in Mono-Inyo Basin, California, Pursuant to Committee Resolution Adopted November 25, 1947." March 1948.

Conkling, Harold. "Report on Owens Valley Project, California." Department of the Interior, United States Reclamation Service. September 1921.

Lee, Charles. "An Intensive Study of the Water Resources of a Part of Owens Valley, California." United States Department of the Interior, Geological Survey. Water Supply Paper 294. 1912.

CHAPTER II. AREA OF INVESTIGATION

The area of investigation consists generally of the territory between the Nevada-California state line on the northeast, and the Sierra Nevada and Tehachapi Mountains on the west. The southern boundary is the drainage divide of the San Gabriel, San Bernardino, Providence, and New York Mountains. The area, which is shown on Plate 1, extends about 300 miles from the drainage divide north of Mono Lake, to the Providence and New York Mountains on the south. Included in the 26,669-square mile area of investigation are portions of Mono, San Bernardino, Kern, and Los Angeles Counties, and all of Inyo County.

This chapter gives information on the climate, cultural development, and water supply of the area as a whole, and also presents a brief description of each of the hydrographic units contained in the area of investigation.

Climatic Conditions

The southern Lahontan area is a region of broad desert valleys occasionally interspersed with and separated by barren mountain ranges. Climatic conditions vary widely with topography and latitude, but are generally characterized by light rainfall with extreme changes in seasonal and day-to-night temperatures. Summer daytime temperatures are high except at high elevations in the mountains, and winter temperatures below 32° F. are common in the high mountains and frequently occur over much of the area.

Annual rainfall varies from about 2 to 7 inches in the desert valleys, while the mountain and upper desert areas experience greater



OWENS VALLEY

Josef Muench

Annual rainfall varies from about two to six inches in the desert valleys, while the mountains experience greater amounts of precipitation in the form of snow.

amounts of precipitation in the form of snow. This precipitation, although extremely light and sporadic over much of the area, is the major source of ground water replenishment. Typical mean seasonal depths of precipitation in desert valleys are 6.1 inches at Bishop, 1.6 inches at Greenland Ranch in Death Valley, 4.7 inches at Independence, 4.9 inches at Mojave, 7.6 inches at Lancaster, 4.1 inches at Barstow, and 5.5 inches at Victorville. Mountain areas, such as Lake Sabrina in the Sierra Nevada west of Bishop and Big Pines Park in the San Gabriel Mountains, experienced a mean seasonal precipitation of 16.1 inches and 25.6 inches, respectively, during the period from 1897-98 to 1946-47. Generally, precipitation occurs from November through April for the entire area.

Cultural Development

The barren, semiarid character of the southern Lahontan area has greatly limited cultural development. It is mainly confined to valley areas where ground water supplies are available.

Irrigated agriculture is the primary economic activity throughout much of the area. Relatively large acreages are irrigated in Antelope and Mojave River Valleys by the use of ground water. Crops planted to the largest acreages are alfalfa, pasture, and field crops. The raising of livestock is a secondary agricultural activity in the Lahontan region and is usually undertaken in areas where irrigation is impractical.

In Mono Lake and Owens River Units, a substantial part of the habitable land is owned outright by either the United States or the City of Los Angeles, and practically all federal land is withdrawn from public entry for protection of the water supply of the City of Los Angeles.

However, much of the federal land is open to mineral entry, grazing, and recreation. The City of Los Angeles leases substantial acreages to agricultural operators, and a large percentage of the land owned by the City is open to hunting, fishing, and hiking, thus making the area one of the State's finest recreational areas. During years when water supplies in the two basins are more than sufficient to meet the City's exportation requirements, the City makes water available for irrigation of leased lands. In addition, during wet years the City spreads excess water over the land surface, thereby supporting the growth of native grasses. During dry years, little or no water is available for irrigation of leased lands or for spreading. The survey period occurred during a dry year and no water was spread on surrounding agricultural lands, so the acreage of irrigated agriculture reported for Owens River and Mono Lake Units reflect the minimum irrigated area.

Mining is the major industry in the southern Lahontan region. Mineral deposits, including saline deposits in dry lakebeds, constitute the majority of extracted materials. Many of these minerals have fluctuating market prices, hence, much of the mining tends to be sporadic. Gravel and limestone deposits, which provide the raw materials for more stable forms of mining, are also located in the territory.

Recent increases in industrial and recreational activities have resulted in increased population in many urban areas. Table 1 shows population in 1940, 1950, and 1960 in three principal cities as well as four unincorporated urban centers. The unincorporated urban centers do not have fixed boundaries, thus population figures over the years are not entirely comparable. Population for the portion of each county

contained within the southern Lahontan area for the years 1940, 1950, and 1960 is shown in Table 2.

TABLE 1

POPULATION OF PRINCIPAL URBAN CENTERS IN
SOUTHERN LAHONTAN AREA

City	1940	1950	1960
Barstow	2,100	6,100	11,600
Bishop	1,500	2,900	2,900
Lancaster*	2,100	3,600	26,000
Lone Pine*	--	1,400	1,300
Mojave*	1,200	2,100	1,800
Trona*	--	2,500	1,100
Victorville	2,000	3,200	8,200

*Unincorporated area.

TABLE 2

POPULATION OF COUNTIES OR PORTIONS OF COUNTIES
WITHIN SOUTHERN LAHONTAN AREA

County	1940	1950	1960
Inyo	7,600	11,700	11,700
Kern*	1,500	11,500	36,700
Los Angeles*	7,700	16,100	68,200
Mono*	1,400	1,400	1,400
San Bernardino*	<u>11,900</u>	<u>30,300</u>	<u>59,000</u>
TOTALS	30,100	71,000	177,000

*Estimated.

Many recreation areas, centered around lakes and streams, have been and are still being developed and utilized in the southern Lahontan area. The majority of these areas are located in the northern region, primarily in the Mono Lake and Owens Valley areas. Principal recreational activities are fishing, hunting, boating, camping, and water sports.

Water Supply

When a winter storm passes over the eastern part of California dropping snow on the rugged High Sierra, rainfall pelts the desert slopes of the San Gabriel and San Bernardino Mountains. Creeks fill and converge with larger streams on the valley floor. Some of the runoff continues over long distances, but much of it disappears underground to vast subsurface reserves. The intermittent stream is a characteristic of the Lahontan area, with the exception of a few perennial streams in Mono Basin and Owens River Valley.

During the summer, a flash flood may momentarily fill desert arroyos with torrents of water, tumbling huge boulders in paths of destruction; but this product of the summer thunderstorm evaporates quickly under the intense heat of the desert sun, and adds little to the overall water supply.

The development of water supplies has been influenced to a large extent by the growth patterns of urban land uses and irrigated agriculture. Three areas that have been affected by accelerated land use changes are Antelope Valley, Mojave River, and Mono-Owens River areas.

The Antelope Valley area relies to a large extent on ground water extractions, which in 1960 amounted to an estimated 307,000 acre-feet. Though the storage capacity is great, ground water levels throughout the Antelope Basin have been dropping over the past 30 years. Continuous overdraft has caused some water tables to drop as much as 120 feet during the past 20 years. The need for imported water to meet overdraft conditions and to provide for future growth requirements led to the formation of the Antelope Valley-East Kern Water Agency. The safe yield of local water

supplies within the agency boundary has been estimated to be 60,000 acre-feet per year. Overdraft in this same area is estimated to be 93,500 acre-feet per year. To alleviate the water shortage, this Agency has contracted for a maximum entitlement of 138,400 acre-feet annually of state project water to be delivered beginning in 1972.

Local water supplies in the Mojave River area are surface flow at several locations along the river and ground water basins. Water levels are gradually dropping, particularly in the Upper, Middle, and Lower Mojave Hydrologic Subunits where the Department estimates local water supplies to be about 73,000 acre-feet per year. The deficiency in this area was approaching 35,000 acre-feet annually by 1961. The Mojave Water Agency was formed in 1959 to provide for future water needs, and has contracted for a maximum delivery of 50,800 acre-feet of water annually from the California Aqueduct with deliveries to begin in 1972.

Other water service agencies contracting for state project water are the Palmdale Irrigation District (17,300 acre-feet annually), Crestline-Lake Arrowhead Water Agency (5,800 acre-feet annually), and the Littlerock Creek Irrigation District (2,300 acre-feet annually).

The Mono and Owens River areas contain large ground water reserves supplied by a seasonal natural runoff which has been estimated to be 726,000 acre-feet per year. A portion of this water is exported to the south coastal area by the City of Los Angeles through the Los Angeles Aqueduct. Water is diverted from Mono Basin and conveyed through tunnels to the headwaters of the Owens River. Water is then diverted into the aqueduct from the Owens River at a point about 15 miles south of Big Pine and is transported 233 miles through conduit to the City of Los Angeles.

This export has amounted to about 342,000 acre-feet per year, the present capacity of the aqueduct. The City of Los Angeles has announced plans to export an additional 152,000 acre-feet of water per year through a proposed second barrel of the Los Angeles Aqueduct.

Hydrographic Units

To facilitate hydrographic analyses, the southern Lahontan Hydrographic Area was divided into six hydrographic units, based on consideration of surface drainage, cultural development, and the geology of ground water occurrence. These units and their numerical designations are: Mono Lake (6-7), Adobe Valley (6-8), Owens River (6-9), Death Valley (6-10), Mojave River (6-11), and Antelope Valley (6-12). Table 3 lists the gross area of each of the hydrographic units.

TABLE 3
AREAS OF HYDROGRAPHIC UNITS, SOUTHERN LAHONTAN AREA

Hydrographic unit	:	Acres
Mono Lake	(6-7)	429,000
Adobe Valley	(6-8)	188,000
Owens River	(6-9)	2,005,000
Death Valley	(6-10)	9,858,000
Mojave River	(6-11)	3,064,000
Antelope Valley	(6-12)	<u>1,524,000</u>
TOTAL		17,068,000

The remaining portion of this chapter presents a brief description of the physiography and cultural development of each hydrographic unit.

Mono Lake Unit (6-7)

The Mono Lake Hydrographic Unit, as shown on Plate 1, is a nearly rectangular area located at the very northernmost part of the

investigational area and is bounded on the west by the rugged Sierra Nevada and on the east by the California-Nevada state line.

Mono Lake, covering an area of 86 square miles and reaching a maximum depth of 150 feet, is the major feature of the area. The waters of this lake are unsuitable for general use due to the large mineral content, which is considerably in excess of that of the Pacific Ocean.

The original industry in the area was mining which began in the 1860's, although some ranching was also attempted at that time. The mining boom eventually subsided and population in the area declined rapidly.

At present, the Federal Government has withdrawn a large percentage of the land to protect the water supply of the City of Los Angeles, which has built storage reservoirs and stream diversion facilities in the area.

Recreational use of the lakes and streams is a major activity in the area. The numerous lakes receive the heaviest recreational demand for fishing, hiking, camping, and water sports.

Adobe Valley Unit (6-8)

The Adobe Valley Unit is a small irregular-shaped area southeast of the Mono Lake Unit as shown on Plate 1. The unit is bounded on the north by the California-Nevada border, on the east by the Benton Range, on the south by the drainage boundary running through Glass Mountain, and on the west by the Cowtrack Mountain Divide. The bordering mountains range in elevation from 7,100 to 11,100 feet.

Development of ground water supply in the basin area has been limited because most of the land is in federal ownership, and therefore withdrawn from entry. For this reason, cattle raising has become the

major industry. The northeast and southwest portions of the basin constitute a part of the Inyo National Forest and are thus unavailable for private use.

Owens River Unit (6-9)

The Owens River Unit, consisting of approximately 3,100 square miles, is a long, narrow area bordered on the north by the Mono Lake and Adobe Valley Units as shown on Plate 1. The southern boundary crosses the north portion of the Coso Mountains. The east boundary of the unit consists of the White and Inyo Mountains and the west boundary, the Sierra Nevada.

This hydrographic unit contains the entire deeply incised valley surrounding the Owens River. Lake Crowley, Owens Lake, and part of Haiwee Reservoir are also included in the Unit.

Recreational facilities are located extensively throughout the Owens River area and are the most rapidly developing activity. A large number of streams, lakes, and reservoirs located on the basin floor and in the Sierra Nevada foothill area are used primarily for fishing. Other activities in the area include camping, hiking, hunting, and various water sports.

Death Valley Unit (6-10)

Largest of the southern Lahontan hydrographic units is the Death Valley Unit, which contains about 15,400 square miles of desert area. The unit boundaries, as shown on Plate 1, consist of the Mojave River drainage divide and the Antelope Valley Hydrographic Unit on the south, the California-Nevada state line on the northeast, and the drainage divide of the Tehachapi, Sierra Nevada, Inyo and White Mountains on the west.

Within the unit there are limited farming and grazing. Industrial activity is centered around the mining of saline deposits, but the most noteworthy feature of this unit is the popularity of Death Valley as a winter recreational center. Close to 400,000 vacationers visited the area during 1961.

Mojave River Unit (6-11)

The southernmost unit of the Lahontan Hydrographic Area is the Mojave River Unit. This unit, comprising 4,800 square miles, is bordered by the Death Valley Unit on the east and north and the Antelope Valley Unit on the west. The southern extent of the area, as shown on Plate 1, is terminated by the Ord, Providence and New York Mountains.

The principal water supply in the area is the ground water along the Mojave River and its tributaries. This supply has resulted in a relatively consistent development of agriculture.

Mining, consisting of sporadic extraction of minerals, is the major industry of the area; but the large cement manufacturing plants with more stable productions are a greater stimulus to growth.

Because the major portion of this territory is within relatively easy driving distance of the greater Los Angeles area, weekend recreation has become an important activity during the winter months when many people seek a weekend of rest and quiet in the mild desert climate.

Antelope Valley Unit (6-12)

The Antelope Valley Unit is a triangular-shaped area with the northern apex near Randsburg in Kern County, as shown on Plate 1. The northwest and southwest boundaries parallel the Tehachapi and San Gabriel Mountains, respectively.

Agriculture has been the most important activity in this area until recently, with about 63,900 acres devoted to irrigated farming. In the last two decades, aircraft, defense, and related industries have become increasingly more important to the economy. However, smaller industries are still generally associated with agricultural needs and developments.

This area is similar to the Mojave River Unit in that winter recreational activities have increased tremendously in the last few decades due to the warm desert climate and its proximity to the greater Los Angeles area.

CHAPTER III. LAND USE

The type, location, and areal extent of present land use within the study area were determined by a detailed land use survey conducted during the summer of 1961. The results of that survey are presented in this chapter, along with a discussion of methods and procedures used in classifying results. This chapter also presents comparisons of land use found during the present survey and during previous surveys.

Methods and Procedures

Mapping of the southern Lahontan area was initiated in July 1961 by Department field crews. All the land use types requiring applied water were delineated by the survey crews on the most recent vertical aerial photographs available, except for some isolated development east of Bishop near the Nevada state line where photos were supplemented by United States Geological Survey quadrangle maps. In the office, field delineations were transferred by projection to reproducible prints of United States Geological Survey quadrangle maps at a scale of 1 inch equals 2,000 feet. These maps served as area control maps, ensuring the accuracy of the succeeding processes, while the reproducible prints served as masters for reproducing land use delineations on vellum prints. The individual areas of land use types were cut from the vellum prints and weighed, and, by machine computation, these weights were converted into total acreages of individual land use types.

For a critical hydrologic analysis, determining and compiling all types of land use for the entire hydrographic unit would be desirable. This would permit a comprehensive analysis and evaluation of the various

levels of water use for the entire area. However, such a complete compilation is not felt to be warranted at present. Therefore, the usual practice is to map in their entirety only those areas which are underlain by water-bearing material. In those areas which are not underlain by water-bearing material, only types of land use requiring applied water are mapped. All other types of land use in areas not underlain by water-bearing material are tabulated in a category called "unclassified".

Classification of Land Use

For analysis and presentation, the various land uses were grouped into two major categories under water service areas -- urban and suburban and irrigated agriculture -- and into three major categories under nonwater service areas -- nonirrigated agriculture, native vegetation, and unclassified. Both major categories under water service areas include several classes of land use, and these several classes consist of various types of land use, grouped according to their water requirements.

The major categories, classes, and types of land use included in the classification are as given in the outline below. The classes of land use given here are similar to those used in the previously mentioned Bulletins Nos. 2 and 101, except that parks, golf courses, and cemeteries, classified as irrigated pasture in Bulletin No. 2, are included under unsegregated urban and suburban area in this report.

In delineating land use types in the field, no attempt was made to exclude such items as streets, roads, railroads, powerline rights-of-way, and other essentially nonwater-using lands occurring within the surveyed areas. Instead, these land uses were extracted from overall land

WATER SERVICE AREA

Urban and Suburban Category

<u>Class of Land Use</u>	<u>Type of Land Use</u>
Residential	Single and multiple family houses and apartments, institutions, motels, 1- and 2-story hotels, trailer parks, and residential subdivisions under construction at time of survey.
Recreational residential .	Weekend and summer home tracts within a primarily recreational area.
Commercial	All classes of commercial enterprises, including strip commercial, downtown commercial, and schools, but excluding 1- and 2-story hotels, motels, and institutions.
Industrial	All classes of industrial land uses involving manufacturing, processing, and packaging, but excluding extractive industries (oil, sand, and gravel), air fields, and storage, distribution, and transportation facilities.
Unsegregated urban and suburban area	Farmsteads, dairies, livestock ranches, parks, cemeteries, and golf courses.
Included nonwater service area	Oil fields, tank farms, vacant lots, quarries, gravel pits, warehouses and storage yards, railroads, public streets, landing strips of airfields, and subdivisions with streets and utilities in place but with no buildings constructed.

Irrigated Agriculture Category

<u>Class of Land Use</u>	<u>Type of Land Use</u>
Alfalfa	Alfalfa raised for hay, seed, or pasture.

<u>Class of Land Use (continued)</u>	<u>Type of Land Use</u>
Pasture	Irrigated grasses and legumes other than alfalfa used for livestock forage.
Citrus and subtropical . . .	Oranges, lemons, grapefruit, tangerines, avocados, dates, and olives.
Truck crops	Vegetables of all varieties, melons, flower seed, and nursery crops.
Field crops	Cotton, sorghum, sugar beets, and field corn.
Deciduous fruits and nuts .	All varieties.
Small grains	Barley, wheat, and oats.
Vineyards	All varieties.
Fallow	Tilled, between crops.
Included nonwater service area	Public highways and roads, farm access roads, canals, and other inclusions not devoted to crop production, including idle and abandoned lands.

NONWATER SERVICE AREA

	<u>Type of Land Use</u>
<u>Nonirrigated Agriculture Category</u> . .	All nonirrigated agriculture overlying defined ground water basins.
<u>Native Vegetation Category</u>	Native grasses, brush, and trees, including phreatophytes, overlying defined ground water basins.
<u>Unclassified Category</u>	Bare ground, including river washes and beaches, and water surfaces overlying defined ground water basins. Also includes nonirrigated agriculture and native vegetation not overlying defined ground water basins.

use totals by applying to each major land use class a percentage value, or reduction factor, appropriate for that class. These amounts extracted were then classified as "included nonwater service area". Reduction factors were derived by analyzing aerial photographs to determine the area in streets, roads, and rights-of-way within field delineated parcels of land use. These nonwater-using areas were then compared to the gross delineation in order to derive the reduction percent. The appropriate reduction factors for the major classes of land use are presented in Table 4. The net acreage values used in the tables summarizing land use represent the gross acreage values minus those portions of the gross values that have been deducted for these included nonwater service areas.

TABLE 4

FACTORS FOR REDUCTION OF GROSS AREAS
TO NET WATER SERVICE AREAS

Land use	: Percent deducted from gross area
Residential	20
Commercial	30
Industrial, manufacturing	25
Schools	15
Parks, cemeteries, and golf courses	15
Feedlots, dairies	10
Farmsteads	5
Irrigated agriculture	5

Many areas located within military reservations throughout the area of investigation were restricted to entry and thus could not be mapped in the field. Consequently, the land uses occurring within the boundaries of the military reservations are included in the summary tables under the category "unclassified".

Results of Land Use Survey

Important to the investigation is not only the present land use, but also the comparison of present with past land use. From these comparisons, the investigator can analyse the direction and size of land use changes. By combining these with computations in changes of water use, he can estimate future water requirements.

Present Land Use

The results of the land use survey indicate that more than 187,000 acres of land in the southern Lahontan area required water service in 1961. As shown in Table 5, which summarizes land use on the basis of hydrographic units, about 98,000 acres of this total were included in the urban and suburban classes, while more than 89,000 acres were in the irrigated agricultural classes. Table 5 also shows that about 158,000 acres, or approximately 84 percent of the total lands requiring water service, are located within two hydrographic units - the Mojave River and Antelope Valley Units.

Table 6 summarizes land use within counties in the area of investigation. Appendix B lists land use in hydrologic units, subunits, and subareas of the southern Lahontan area.

Details of the patterns of land use in the survey area are given on Plates 3A, 3B, 3C, and 3D, "Present Land Use". Although the acreages of nonwater service areas within urban and suburban and irrigated agricultural areas are shown individually on the tables in Appendix B, they were not differentiated on the plates. Also, no differentiation was made on these plates between developed nonwater service lands, such as



OPEN PIT MINING OF BORATE ORES

Spence Air Photos

The southern Lahontan area is a major supplier of borates.

TABLE 5

LAND USE IN HYDROGRAPHIC UNITS OF THE SOUTHERN LAHONTAN AREA IN 1961

In acres

Category and class of land use				Hydrographic Units			Antelope Valley	Totals
	Mono Lake	Adobe Valley	Owens River	Death Valley	Mojave River			
<u>WATER SERVICE AREA</u>								
Urban and Suburban								
Residential	80	0	1,160	2,100	8,030	7,280	18,650	
Recreational residential	120	0	340	40	3,230	550	4,280	
Commercial	30	0	300	400	930	930	2,590	
Industrial	0	0	40	90	170	140	440	
Unsegregated urban and suburban area	20	- ^a	<u>910</u>	<u>1,100</u>	<u>3,220</u>	<u>5,410</u>	<u>10,730</u>	
Subtotals								
250								
Included Nonwater Service Area								
70								
Gross Urban and Suburban Area								
320								
<u>Irrigated Agriculture</u>								
Alfalfa	0	0	1,380	4,220	9,490	41,220	56,410	
Pasture	0	0	2,490	980	2,020	2,630	8,120	
Citrus and subtropical	0	0	0	0	0	10	10	
Truck crops	0	0	0	220	160	2,110	2,490	
Field crops	0	0	0	250	800	2,290	3,390	
Deciduous fruits and nuts	0	0	0	30	0	210	1,410	
Small grains	0	0	0	180	50	4,890	5,120	
Vineyards	0	0	0	0	0	60	60	
Subtotals	0	0	3,950	5,850	12,730	54,720	77,250	
Fallow	0	0	20	130	250	2,350	2,750	
Included Nonwater Service Area	0	0	<u>910</u>	<u>670</u>	<u>260</u>	<u>6,850</u>	<u>9,290</u>	
Gross Irrigated Agriculture	0							
GROSS WATER SERVICE AREA	320							
NONWATER SERVICE AREA								
Nonirrigated Agriculture								
Native Vegetation	189,970	38,650	16,530	12,920	6,810	115,790	152,050	
Unclassified	<u>238,710</u>	<u>149,350</u>	<u>1,256,730</u>	<u>5,277,770</u>	<u>1,185,360</u>	<u>501,610</u>	<u>8,118,920</u>	<u>8,609,520</u>
GROSS NONWATER SERVICE AREA	128,680	<u>188,000</u>	<u>1,295,960</u>	<u>9,837,640</u>	<u>2,999,170</u>	<u>1,431,050</u>	<u>16,880,500</u>	
TOTALS	129,000	188,000	2,005,000	9,858,000	3,064,000	1,524,000	17,068,000	

a. Less than five acres.

LAND USE IN COUNTIES OF THE SOUTHERN LAHONTAN AREA IN 1961

In acres

Category and class of land use	Inyo County	Kern County*	Los Angeles County*	Mono County*	San Bernardino County*	Total
<u>WATER SERVICE AREA</u>						
Urban and Suburban						
Residential	1,190	2,950	5,340	290	8,880	18,650
Recreational residential	60	80	70	400	3,670	4,280
Commercial	300	460	680	130	1,020	2,590
Industrial	40	90	70	0	240	440
Unsegregated urban and suburban area	<u>870</u>	<u>1,470</u>	<u>4,400</u>	<u>210</u>	<u>3,780</u>	<u>10,730</u>
Subtotals	2,460	5,050	10,560	1,030	17,590	36,690
Included Nonwater Service Area	<u>1,500</u>	<u>10,220</u>	<u>11,580</u>	<u>260</u>	<u>37,860</u>	<u>61,420</u>
Gross Urban and Suburban Area	3,960	15,270	22,140	1,290	55,450	98,110
<u>IRRIGATED AGRICULTURE</u>						
Alfalfa	890	12,060	32,210	1,150	10,100	56,410
Pasture	2,370	820	2,090	460	2,380	8,120
Citrus and subtropical	0	0	10	0	0	10
Truck crops	40	520	1,720	0	210	2,490
Field crops	210	490	1,820	40	830	3,390
Deciduous fruits and nuts	0	10	1,390	30	220	1,650
Small grains	0	380	4,690	0	50	5,120
Vineyards	0	0	60	0	0	60
Subtotals	3,510	14,280	45,990	1,680	13,790	77,250
Fallow	0	330	2,100	20	300	2,750
Included Nonwater Service Area	<u>710</u>	<u>1,070</u>	<u>6,120</u>	<u>430</u>	<u>1,060</u>	<u>9,390</u>
Gross Irrigated Agriculture	<u>4,220</u>	<u>15,680</u>	<u>52,210</u>	<u>2,130</u>	<u>15,150</u>	<u>89,390</u>
GROSS WATER SERVICE AREA	8,180	30,950	74,350	3,420	70,600	187,500
<u>NONWATER SERVICE AREA</u>						
Nonirrigated Agriculture	14,000	30,090	96,670	3,000	8,290	152,050
Native Vegetation	2,702,590	766,810	362,110	418,900	3,868,510	8,118,920
Unclassified	<u>3,825,920</u>	<u>827,750</u>	<u>259,220</u>	<u>293,300</u>	<u>2,703,340</u>	<u>8,609,530</u>
GROSS NONWATER SERVICE AREA	<u>6,542,510</u>	<u>1,624,650</u>	<u>718,000</u>	<u>1,415,200</u>	<u>6,580,140</u>	<u>16,886,500</u>
TOTALS	6,550,690	1,655,600	792,350	1,418,620	6,650,740	17,068,000

*Acreages for portion of county within investigational area.

nonirrigated agriculture, and undeveloped nonwater service lands, such as native vegetation.

In the southern Lahontan area, water service to municipalities and other urban and suburban areas is provided by commercial water companies and a variety of miscellaneous public water agencies, while water developments for irrigated agriculture have been made by private individuals through the use of ground water and, to some extent, through surface water diversions. Table 7 summarizes land use within the boundaries of the two small irrigation districts in Antelope Valley. Within recent years two large water agencies were organized in the Mojave River and Antelope Valley areas expressly for contracting for imported water to be made available through the State Water Facilities. The Mojave Water Agency is located in San Bernardino County and the Antelope Valley-East Kern Water Agency is located in Los Angeles and Kern Counties. Land uses occurring within the boundaries of these agencies are also summarized in Table 7. Portions of the Mojave Water Agency and the Antelope Valley-East Kern Water Agency that fall outside the area of investigation are not included in Table 7. The boundaries of the four agencies listed in Table 7 are shown on Plates 3C and 3D.

Changes in Land Use

Major changes were found in the area requiring water service as the most recent survey that was conducted in the study area north of Kern and San Bernardino Counties was in 1950, and the last survey south of this line was in 1957.

As shown in Table 8, in the northern portion of the investigational area, the gross urban and suburban water service areas increased

TABLE 7
LAND USE IN SERVICE AREAS OF MAJOR WATER AGENCIES
OF THE SOUTHERN LAHONTAN AREA IN 1961

In acres

Category and class of land use	: Littlerock	: Antelope	: Mojave			
	: Creek	: Palmdale	: Valley-East	Kern Water	Water	Total
	: Irrigation	: Irrigation	: Kern Water	: Agency	: Agency	
<u>R SERVICE AREA</u>						
<u>Urban and Suburban</u>						
Residential	40	850	5,650	5,910	12,450	
Recreational residential	0	0	50	1,730	1,780	
Commercial	30	120	730	730	1,610	
Industrial	0	a	120	150	270	
Unsegregated urban and suburban area	<u>110</u>	<u>190</u>	<u>4,200</u>	<u>3,460</u>	<u>7,960</u>	
Subtotals	180	1,160	10,750	11,980	24,070	
Included Nonwater Service Area	<u>90</u>	<u>1,250</u>	<u>15,450</u>	<u>33,090</u>	<u>49,880</u>	
Gross Urban and Suburban Area	270	2,410	26,200	45,070	73,950	
<u>Irrigated Agriculture</u>						
Alfalfa	30	0	43,740	10,090	53,860	
Pasture	a	10	2,470	2,300	4,780	
Citrus and subtropical	a	0	0	0	0	
Truck crops	20	30	1,980	200	2,230	
Field crops	0	0	2,260	830	3,090	
Deciduous fruits and nuts	520	10	490	220	1,240	
Small grains	0	0	4,400	50	4,450	
Vineyards	0	0	60	0	60	
Subtotals	570	50	55,400	13,690	69,710	
Fallow	a	0	2,210	300	2,510	
Included Nonwater Service Area	<u>480</u>	<u>a</u>	<u>5,660</u>	<u>1,050</u>	<u>7,190</u>	
Gross Irrigated Agriculture	<u>1,050</u>	<u>50</u>	<u>63,270</u>	<u>15,040</u>	<u>79,410</u>	
GROSS WATER SERVICE AREA	1,320	2,460	89,470	60,110	153,360	
<u>WATER SERVICE AREA</u>						
<u>Nonirrigated Agriculture</u>						
Native Vegetation	120	1,010	110,500	7,620	119,250	
Unclassified	1,090	3,630	570,200	979,240	1,554,160	
	0	450	<u>592,900</u>	<u>1,139,000</u>	<u>1,732,350</u>	
GROSS NONWATER SERVICE AREA	<u>1,210</u>	<u>5,090</u>	<u>1,273,600</u>	<u>2,125,860</u>	<u>3,405,760</u>	
TOTALS	2,530	7,550	1,363,070	2,185,970	3,559,120	

Less than five acres.

from about 800 acres in 1950 to 5,300 acres in 1961, while the gross agricultural water service areas decreased from about 15,600 acres in 1950 to 6,300 acres in 1961. This represents an overall decrease in gross water service area from 16,400 acres in 1950 to 11,600 acres in 1961, or about 29 percent.

In the southern portion of the area of investigation, the gross urban and suburban water service areas increased from about 17,100 acres in 1957 to 92,800 acres in 1961, however, approximately 42,800 acres of this increase consisted of subdivided land with streets and utilities in place but with no buildings constructed. The gross agricultural water service areas decreased from about 90,300 acres in 1957 to 83,100 acres in 1961. The overall gross area requiring water service increased about 64 percent from about 107,400 acres in 1957 to 175,900 acres in 1961.

The major part of the decline in irrigated agriculture occurred in Mono Lake, Adobe Valley, Owens River, and Antelope Valley Units. Changes in land use in the southern portion of the study area are delineated on Plate 4, "Change in Land Use, Antelope and Mojave River Valleys and Vicinities, 1957 to 1961". Changes in land use occurring in each hydrographic unit are discussed in the following sections.

Mono Lake Unit (6-7). The gross urban and suburban area requiring water service in the Mono Lake Unit totaled about 20 acres in 1950 and 320 acres in 1961. The gross irrigated agricultural acreage, which in 1950 was 2,100 acres planted in pasture, was discontinued by 1961 when no irrigated acreage was found.

TABLE 8

CHANGE IN LAND USE IN THE
SOUTHERN LAHONTAN AREA

In acres

Category and class of land use	Hydrographic Units in Northern Portion			Northern Death Valley			Totals		
	Mono Lake	Adobe Valley	Owens River	1950 : 1961	Change : 1950 : 1961	1950 : 1961	Change : 1950 : 1961	1950 : 1961	Change : 1950 : 1961
WATER SERVICE AREA									
Urban and Suburban	a	80	a	0	0	a	1,160	a	a
Residential	a	120	a	0	0	a	340	a	0
Recreational residential	a	30	a	0	0	a	300	a	110
Commercial	a	0	a	0	0	a	40	a	40
Industrial	a	20	a	0	b	a	40	a	40
Unsegregated urban and suburban area	a	—	a	0	b	a	—	a	—
Subtotals	a	250	a	0	b	a	2,750	a	500
Included Nonwater-Service Area	a	70	a	0	b	a	1,410	a	290
Gross Urban and Suburban Area	20	320	300	0	b	800	4,160	3,360	20
Irrigated Agriculture	0	0	0	0	0	4,800	1,380	-3,420	0
Alfalfa	2,000	0	-2,000	2,300	0	-2,300	4,600	2,190	-2,110
Pasture	0	0	0	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0	200	a	700
Truck crops	0	0	0	0	0	0	50	50	0
Field crops	0	0	0	0	0	0	200	-170	100
Deciduous fruits and nuts	0	0	0	0	0	0	100	0	100
Small grains	0	0	0	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0	0	0	0
Subtotals	2,000	0	-2,000	2,300	0	-2,300	9,900	3,950	-5,950
Fallow	a	0	a	0	a	20	a	0	a
Included Nonwater-Service Area	100	0	-100	100	0	-100	200	910	710
Gross Irrigated Agriculture	2,100	0	-2,100	2,400	0	-2,400	10,100	4,880	-5,220
GROSS WATER SERVICE AREA	2,120	320	-1,800	2,400	b	-2,400	10,900	9,040	-1,860

CHANGE IN LAND USE IN THE
SOUTHERN LAJONIAN AREA
(continued)

Category and class of land use	Hydrographic Units in Southern Portion						Totals		
	Southern Death Valley		Mojave River		Antelope Valley				
	1957	: 1961	Change	1957	: 1961	Change	1957	: 1961	Change
<u>WATER SERVICE AREA</u>									
Urban and Suburban									
Residential	730	1,850	1,120	1,350	8,030	6,680	3,250	7,280	4,030
Commercial residential	0	40	40	30	3,230	1,620	900	550	-
Commercial	130	290	160	510	930	890	930	930	3,820
Industrial	100	90	- 10	40	170	130	50	40	2,150
Unsegregated urban and suburban area	100	960	860	450	3,290	2,810	1,500	5,410	400
Subtotals	1,060	3,230	2,170	2,380	15,650	13,270	6,590	14,310	7,720
Included Nonwater-Service Area	1,140	2,690 ^c	8,250 ^c	1,700	35,240 ^d	33,180 ^d	4,190	14,720 ^e	10,530 ^e
Gross Urban and Suburban Area	2,200	12,920 ^c	10,720 ^c	4,140	50,890 ^d	46,750 ^d	10,780	29,030 ^e	18,250 ^e
<u>Irrigated Agriculture</u>									
Alfalfa	4,820	3,560	- 1,260	7,060	9,490	2,430	32,410	41,320	8,910
Pasture	370	660	290	1,960	2,020	60	5,120	2,630	- 2,490
Citrus and subtropical	0	0	0	0	0	0	0	10	10
Truck crops	20	180	160	130	160	30	1,280	2,110	820
Field crops	2,640	60	- 2,580	1,290	800	- 490	2,210	2,290	80
Deciduous fruits and nuts	0	0	0	90	210	120	1,540	1,410	- 130
Small grains	1,990	180	- 1,810	310	50	- 260	14,570	4,860	- 9,680
Vineyards	0	0	0	10	0	- 10	0	60	60
Subtotals	9,840	4,640	- 5,200	10,850	12,730	1,880	57,140	54,720	- 2,420
Fallow	1,400	130	- 1,270	1,030	290	- 780	5,520	2,350	- 3,170
Included Nonwater-Service Area	560	450	- 110	580	260	380	3,340	6,850	3,510
Gross Irrigated Agriculture	11,800	5,220	- 6,580	12,460	13,940	1,480	66,000	63,920	- 2,080
GROSS WATER SERVICE AREA	14,000	18,140 ^c	4,140 ^c	16,600	64,830 ^d	48,230 ^d	76,780	92,950 ^e	16,170 ^e

a. Value not available.

b. Less than 5 acres.

c. Includes approximately 6,000 acres of subdivisions with no buildings constructed.

d. Includes approximately 28,900 acres of subdivisions with no buildings constructed.

e. Includes approximately 7,900 acres of subdivisions with no buildings constructed.

f. Includes approximately 42,800 acres of subdivisions with no buildings constructed.

Adobe Valley Unit (6-8). The gross area requiring water service in the Adobe Valley Unit consisted in 1950 of about 2,400 acres of irrigated pasture with little or no urban and suburban acreage. In 1961, no irrigated agricultural acreage existed, and the urban and suburban acreage was found to be less than five acres.

Owens River Unit (6-9). A large increase in the gross urban and suburban area occurred in the Owens River Unit. In 1950, about 800 acres were subject to this land use, and by 1961 this acreage had increased to about 4,200. Irrigated agriculture decreased during the same period from about 10,100 acres to 4,900 acres, a decrease of about 51 percent. The largest decrease in irrigated agricultural acreage occurred in alfalfa which dropped from 4,800 acres in 1950 to about 1,400 acres in 1961. During the same period, the acreage in irrigated pasture dropped from 4,600 acres to about 2,500 acres. The acreages in alfalfa and pasture in Owens Valley are subject to wide fluctuations from year to year depending on the availability of surface water supplies, as discussed in Chapter II.

Death Valley Unit (6-10). Because the most recent land use survey in the northern portion of the Death Valley Unit (that above the Kern-San Bernardino-Inyo county line) was in 1950, and that of the southern part was in 1957, the unit has been similarly divided in the discussion that follows.

Northern Death Valley. The gross water service area in the northern part of Death Valley Unit showed an increase of about 1,200 acres during the 11-year period. Urban and suburban acreage increased

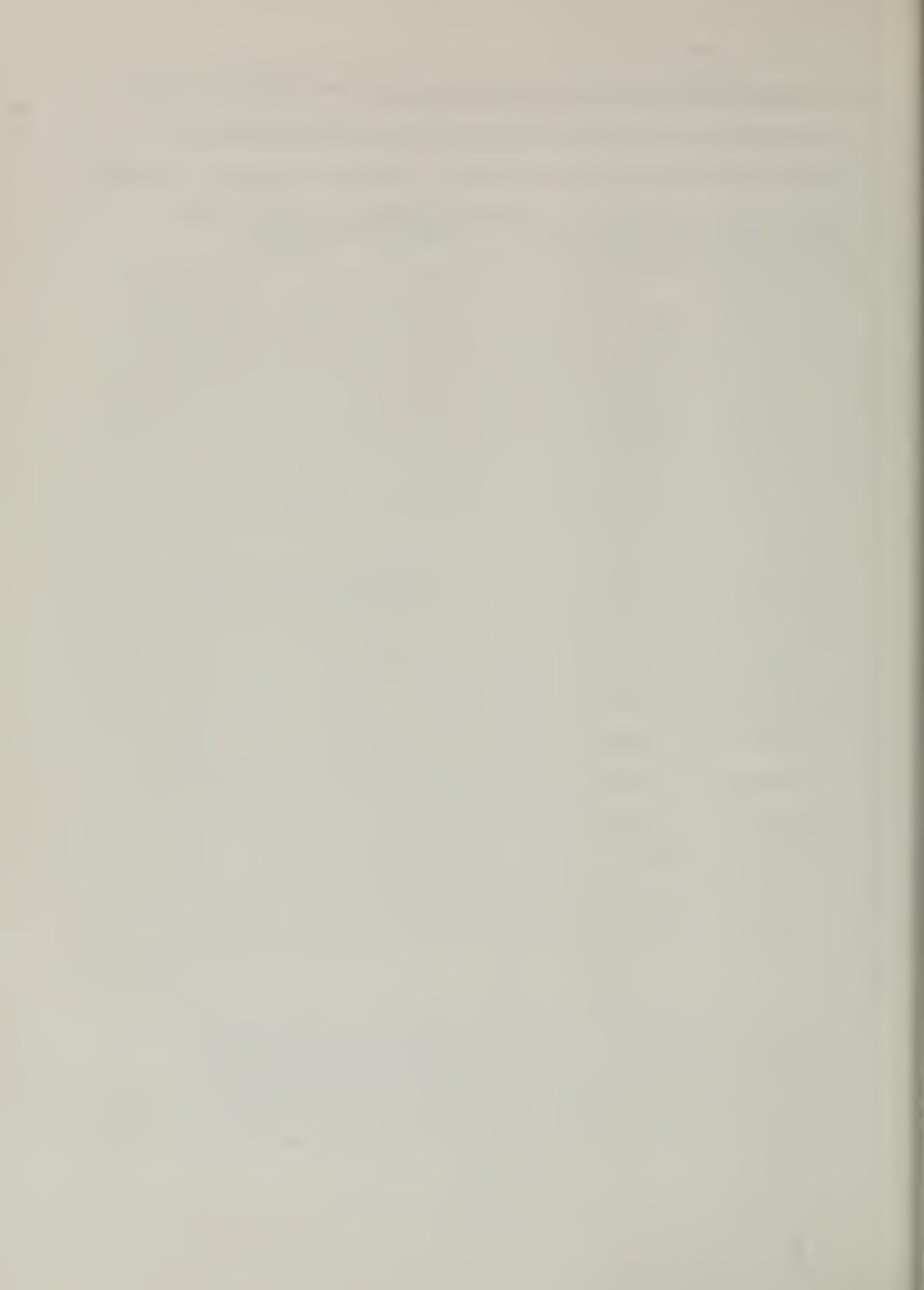
from 20 acres to about 800 acres, or 40 times, and irrigated agricultural acreage increased from 1,000 acres in 1950 to approximately 1,400 acres in 1961.

Southern Death Valley. The gross urban and suburban area in the southern part of Death Valley Unit increased about 10,700 acres, or approximately six times, between 1957 and 1961. However, a large portion of this expansion (6,000 acres) was in lands that consisted of subdivisions with streets and utilities in place, but with no buildings constructed. Irrigated agriculture decreased substantially during the same period, from 11,800 acres in 1957 to 5,200 acres in 1961, with the largest decreases being in field crops, alfalfa, and small grains.

Mojave River Unit (6-11). The Mojave River Unit experienced an increase of approximately 48,200 acres in gross water service area between 1957 and 1961. Urban and suburban acreage increased from 4,100 acres in 1957 to 50,900 acres in 1961. Of this 46,800-acre increase, 3,200 acres were classified in the recreational residential category, which consists of small buildings occupied essentially during vacations or weekends on large (2.5 acres or more) lots. In addition, 28,900 acres of the 46,800-acre increase in urban and suburban area consisted of subdivisions with no buildings constructed. The gross irrigated agricultural acreage increased from 12,500 acres in 1957 to 13,900 acres in 1961, or about 11 percent.

Antelope Valley Unit (6-12). The gross urban and suburban area requiring water service in the Antelope Valley Unit increased from about 10,800 acres in 1957 to 29,000 acres in 1961, or more than 2-1/2 times.

Approximately 7,900 acres of this 18,200-acre increase occurred in subdivisions with no buildings constructed, which are classified in the "Included nonwater service area" category. Irrigated agriculture decreased slightly during the same period, from 66,000 acres to 63,900 acres, a decrease of about 3 percent.



CHAPTER IV. WATER USE

The land areas occupied by various types of water-using developments in the southern Lahontan area were described in Chapter III. Because this land use was classified on the basis of water requirements, appropriate unit values of water use can be applied to estimate the 1961 level of water use in this area. This information is necessary so that adequate programs of water resource development can be planned and implemented to meet the needs of the future growth of the area.

This chapter defines water use, presents the methods used in estimating water use, gives the unit values of water use, and estimates 1961 net water use.

Definition of Water Use

The term "water use" is employed in the broadest sense to include all uses of water by nature under native conditions and by man-made modifications of those natural conditions. It implies the application of water to any one or all of innumerable kinds of uses, both consumptive and nonconsumptive.

Consumptive use is the utilization of water from any source in the process of vegetative growth, such as transpiration and the building of plant tissue, and the evaporation of water from the soil around the plant and foliage, as well as from water surfaces. It also includes the consumption or evaporation of water by urban and nonvegetative types of land use.

In addition to the consumptive use of water as defined above, other irrecoverable losses may also take place. These include such items

as deterioration in water quality to the point where the water is unsuitable for reuse, disposal or seepage of the unconsumed water to bodies of unsuitable quality, and disposal or seepage of the unconsumed water in such a manner as to be uneconomical of recapture for use.

In general, the water for consumptive use is obtained from two sources: natural sources, including direct precipitation and surface runoff, and, as a special case, from a high ground water table; and man-developed sources, that is, water applied through the activities of man. Water furnished from these man-developed sources is termed "applied water". It is applied to satisfy the consumptive use in excess of that supplied from natural sources.

As a practical matter, however, the quantity of water applied is usually in excess of the consumptive use, and that portion of the water that is not consumed or otherwise irrecoverably lost remains part of the water supply.

That portion of the applied water that is consumptively used and that which is otherwise irrecoverably lost is known as the "net water use". Therefore, the difference between the applied water and the net water use is the amount of applied water that is subject to reuse as a part of the common supply. To evaluate the overall needs for water in an area, the net water use must be determined.

Methods of Estimating Water Use

Thus, in areas where none of the applied water becomes available for reuse, the net water use can be determined by measuring the total water applied. On the other hand, in areas where a portion of the applied water becomes available for reuse, economic and technological limitations



JUNE LAKE

Josef Muench

Many recreation areas, centered around lakes and streams, have been and are still being developed and utilized in the southern Lahontan area.

generally preclude measurement of the volume of return flow of reusable water. The net water use in these areas must be determined in another manner; therefore, an indirect method is used.

Using the indirect method most commonly employed, estimates of net water use are obtained by multiplying the areas of the various classes of water-using developments by appropriate average values of unit water use. These unit values of water use reflect average conditions of precipitation and the normal practices associated with urban water distribution and with irrigated agriculture. Variations from normal or average in these factors during the specific year that a land use survey is conducted may result in a difference between the estimated and actual water use during that year. Despite this possibility, the procedures used in this survey are considered adequate and the figures on current levels of water use are thought to be reasonable. Furthermore, these estimates of net water use are believed to be sufficiently sound to permit their use in determining adequacy of presently available water supplies and in planning for such additional supplies as will be necessary to meet current or expected future deficiencies.

Unit Values of Water Use

A complete discussion of the techniques employed in the derivation of unit values of water use is contained in California State Water Resources Board Bulletin No. 2 (listed earlier); consequently, only a very general discussion of those techniques is set forth here. The unit water use values are divided into the general categories of urban and suburban water use values and irrigated agriculture water use values.

Urban and Suburban Water Use Values

A review of the unit values of urban and suburban water use developed for Bulletin No. 2 indicated that, in general, the values derived in 1950 were still the best estimates available. These values were, therefore, used in the derivation of the 1961 levels of net water use on urban and suburban lands. The unit values of urban and suburban net water use are shown in Table 9.

TABLE 9

ESTIMATED MEAN SEASONAL UNIT VALUES OF NET WATER USE ON URBAN AND SUBURBAN LANDS, SOUTHERN LAHONTAN AREA

In feet of depth

Hydrographic unit	:	Net water use
Mono Lake	(6-7)	0.8
Adobe Valley	(6-8)	0.8
Owens River	(6-9)	0.9
Death Valley	(6-10)	0.3
Mojave River	(6-11)	1.2
Antelope Valley	(6-12)	1.0

Mean seasonal unit values of water use on urban and suburban lands in the desert areas of California were estimated for Bulletin No. 2 from records of measured water deliveries obtained from private and public water service agencies. In areas where sewage disposed from urban and suburban areas returns to the ground water body, unit values of water use were computed by deducting the estimated quantity of such return from the amount of water delivered to the area. In other areas where sewage is discharged to the point of final disposal without opportunity for reuse, the gross delivery was taken as a measure of the net water use.

In the Death Valley, Mojave River, and Antelope Valley Hydrographic Units, the class of land use called "recreational residential"

in the tables of land use in Chapter III consists generally of small dwellings on 2.5 to 5-acre tracts. A study made to evaluate the water requirements of this land use class disclosed that these tracts, which were usually occupied less than 25 percent of the time, usually obtained water supplies from agencies that truck water to the dwellings at a relatively high cost, or the recreationists carried in water, either from their permanent dwellings or from nearby sources. Because these supplies were used for drinking, cooking, and essential washing purposes only, the total seasonal volume of water used was determined to be very small (on the order of 0.01 acre-foot per acre). Therefore, this minor use was neglected in the determination of water use in this report. The recreational residential land use class in the Mono Lake and Owens River Hydrographic Units consisted primarily of summer cabins in mountain resort areas. These resort areas have a high occupancy from June through September, and therefore, were included in the evaluation of water use.

Irrigated Agriculture Water Use Values

The unit values of consumptive use of applied water for each of the irrigated crop classes employed in Bulletin No. 2 was estimated by a modification of a method developed by Harry F. Blaney and Wayne D. Criddle of the United States Department of Agriculture. In the present investigation, as in Bulletin No. 2, the increased use of water resulting from multiple cropping practices in some localities was considered in estimating average unit values of water use for truck crops. The values thus derived are presented in Table 10.

TABLE 10

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF WATER
ON IRRIGATED LANDS, SOUTHERN LAHONTAN AREA

In feet of depth

Hydrographic units	Alfalfa	Pasture	Citrus and sub-tropical crops	Truck beets	Sugar beets	Miscellaneous fruits and nuts	Deciduous field crops	Small grains	Rice	Vineyards
<u>Mono Lake</u>										
Applied water	--	1.4	--	--	--	--	--	--	--	--
Precipitation	--	0.9	--	--	--	--	--	--	--	--
TOTAL	--	2.3	--	--	--	--	--	--	--	--
<u>Adobe Valley</u>										
Applied water	--	1.5	--	--	--	--	--	--	--	--
Precipitation	--	0.8	--	--	--	--	--	--	--	--
TOTAL	--	2.3	--	--	--	--	--	--	--	--
<u>Owens River</u>										
Applied water	2.0	1.8	--	1.4	1.2	1.5	--	--	--	--
Precipitation	0.6	0.6	--	0.6	0.6	0.6	--	--	--	--
TOTAL	2.6	2.4	--	2.0	1.8	2.1	--	--	--	--
<u>Death Valley</u>										
Applied water	3.0	2.8	--	1.6	2.2	1.6	--	1.1	4.1	--
Precipitation	0.4	0.4	--	0.4	0.4	0.4	--	0.4	0.4	--
TOTAL	3.4	3.2	--	2.0	2.6	2.0	--	1.5	4.5	--
<u>Mojave River</u>										
Applied water	2.8	2.7	--	1.5	2.2	1.5	2.1	0.9	--	--
Precipitation	0.4	0.4	--	0.4	0.4	0.4	0.4	0.4	--	--
TOTAL	3.2	3.1	--	1.9	2.6	1.9	2.5	1.3	--	--
<u>Antelope Valley</u>										
Applied water	3.0	2.8	2.8	1.4	2.0	1.5	2.2	0.8	4.1	2.4
Precipitation	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
TOTAL	3.6	3.4	3.4	2.0	2.6	2.1	2.8	1.4	4.7	3.0

The values shown in Table 10 represent estimates of the average consumptive uses derived from applied water and from precipitation by the various types of irrigated agriculture. As pointed out before, in the derivation of the net water use for any given year, the volume of applied water required is based on the assumption that the precipitation for the season is approximately equal to the long-time mean. However, as discussed earlier, the use of applied water in irrigated agriculture will actually be somewhat larger or smaller in individual years, varying inversely with the amount of rainfall. A similar effect also occurs in urban use, but variations of rainfall from year to year have a lesser effect upon the use of applied water on urban lands than on irrigated lands. The precipitation data shown on Table 10 indicate that the beneficial value of precipitation is minor.

Estimates of 1961 Net Water Use

Estimates of the net water use in the southern Lahontan area under 1961 conditions of development were made by the indirect method discussed previously; that is, by applying mean seasonal unit values of consumptive use of applied water to the areas of each class of land use.

The estimated amounts of mean seasonal net water use in hydrographic units of the southern Lahontan area for 1961 conditions are presented in Table 11; values estimated for 1950 and 1957 conditions are also given in this table for comparison.

The unit values used to derive the net water use in Table 11 represent the optimum needs of the various types of water using developments for mean conditions of temperature and precipitation and, therefore, provide comparable estimates which show general level of water use. The

actual water use may have differed from the estimated values derived herein, because of irrigation practices and variations from the mean in precipitation and temperature, or because optimum needs were not being met.

Available data from precipitation stations in the desert area indicate that precipitation over the northern portion of the area of investigation during 1950 was about 71 percent of normal, based on the 50-year mean period 1897-98 through 1946-47. In the southern portion of the area, the precipitation was about 52 percent of normal in 1950 and about 33 percent of normal in 1957. During 1961, precipitation was about 46 percent of the 50-year normal figure.

The estimates of net water use shown in Table 11 are, therefore, probably on the low side for 1950, 1957, and 1961 as compared to actual water use in those years. However, the total amount of precipitation in desert areas is usually quite small even during wet years, thus the values given in Table 11 are considered to be reasonable estimates of changes in water use.

In general, the data presented in Table 11 indicate that changes in net water use reflect the changes in land use described in Chapter III. The overall net water use for the area decreased about 13 percent between 1950 and 1961, primarily as a result of decreases in irrigated agriculture. Urban requirements increased substantially, more than 6-1/2 times the water use in 1950, but at the present time, they constitute only about 18 percent of the total net water requirements of the area. On the other hand, water requirements for agriculture decreased in all areas except in the Mojave River and northern Death Valley Units.

TABLE 11

ESTIMATED LEVELS OF NET WATER USE IN THE SOUTHERN LAHONTAN AREA
FOR CONDITIONS OF DEVELOPMENT IN 1950, 1957, AND 1961

In acre-feet

Hydrographic unit	: 1950	: 1957	: 1961	: Differ-	: Differ-
				: 1950-1961	: 1957-1961
<u>Mono Lake Unit</u>					
Irrigated lands	2,800	--	0	- 2,800	--
Urban-suburban areas	<u>100</u>	--	<u>100</u>	<u>0</u>	--
TOTALS	2,900	--	100	- 2,800	--
<u>Adobe Valley Unit</u>					
Irrigated lands	3,300	--	0	- 3,300	--
Urban-suburban areas	<u>0</u>	--	<u>0</u>	<u>0</u>	--
TOTALS	3,300	--	0	- 3,300	--
<u>Owens River Unit</u>					
Irrigated lands	18,200	--	7,300	- 10,900	--
Urban-suburban areas	<u>1,300</u>	--	<u>2,900</u>	<u>1,600</u>	--
TOTALS	19,500	--	10,200	- 9,300	--
<u>Northern Portion of Death Valley Unit</u>					
Irrigated lands	2,000	--	3,200	1,200	--
Urban-suburban areas	<u>200</u>	--	<u>300</u>	<u>100</u>	--
TOTALS	2,200	--	3,500	1,300	--
<u>Total Northern Portion of Study Area</u>					
Irrigated lands	26,300	--	10,500	- 15,800	--
Urban-suburban areas	<u>1,600</u>	--	<u>3,300</u>	<u>1,700</u>	--
TOTALS	27,900	--	13,800	- 14,100	--

ESTIMATED LEVELS OF NET WATER USE IN THE SOUTHERN LAHONTAN AREA
FOR CONDITIONS OF DEVELOPMENT IN 1950, 1957, AND 1961
(continued)

In acre-feet

Hydrographic unit	:	1950	:	1957	:	1961	:	Differ-	:	Differ-
	:		:		:		:	ence	:	ence
								1950-1961	:	1957-1961

Southern Portion of Death Valley Unit

Irrigated lands	23,000	21,900	13,200	- 9,800	- 8,700
Urban-suburban areas	<u>300</u>	<u>700</u>	<u>2,300</u>	<u>2,000</u>	<u>1,600</u>
TOTALS	23,300	22,600	15,500	- 7,800	- 7,100

Mojave River Unit

Irrigated lands	31,400	27,700	34,000	2,600	6,300
Urban-suburban areas	<u>2,600</u>	<u>4,900</u>	<u>19,600</u>	<u>17,000</u>	<u>14,700</u>
TOTALS	34,000	32,600	53,600	19,600	21,000

Antelope Valley Unit

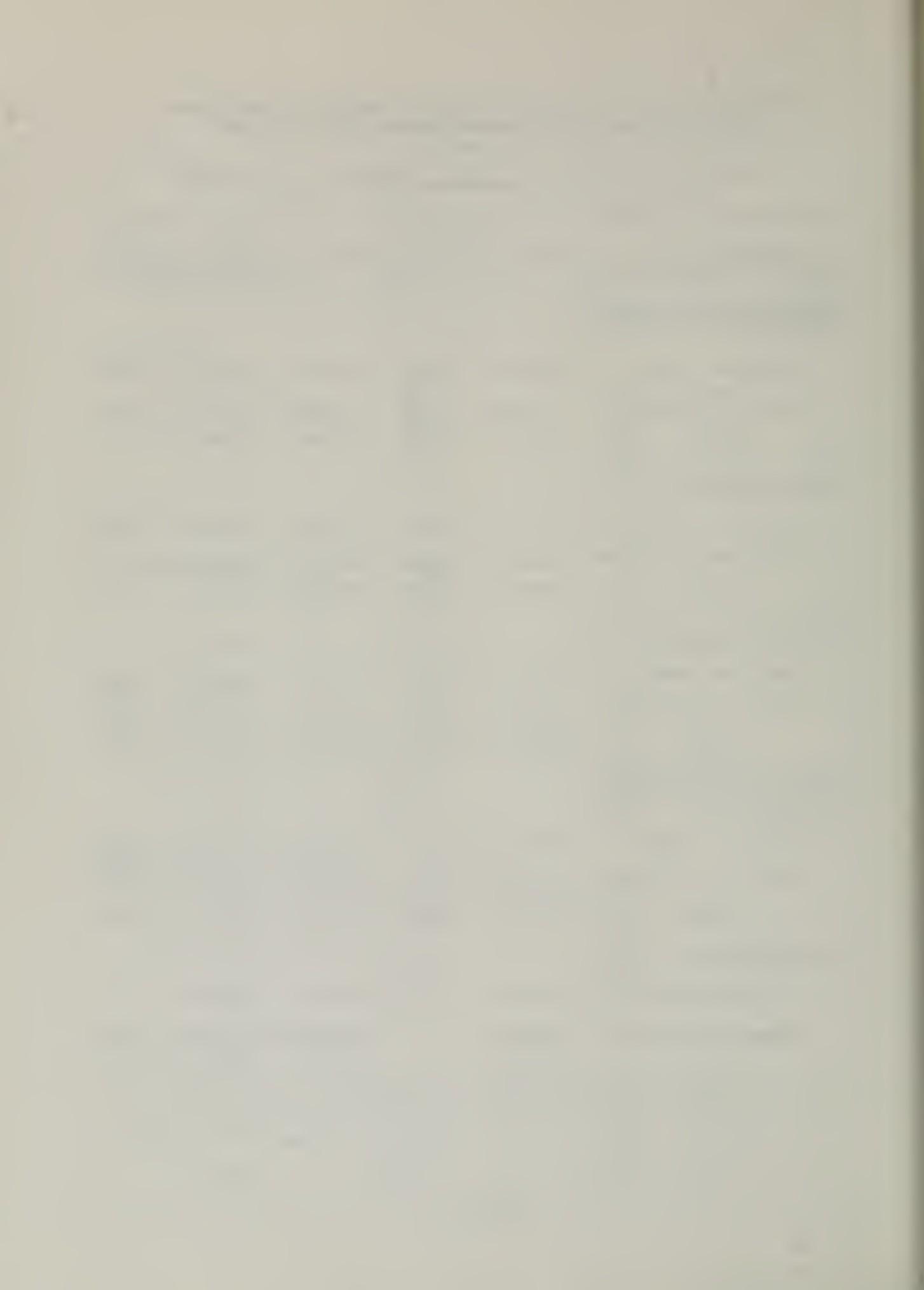
Irrigated lands	200,000	131,700	147,000	- 53,000	15,300
Urban-suburban areas	<u>2,200</u>	<u>9,500</u>	<u>19,000</u>	<u>16,800</u>	<u>9,500</u>
TOTALS	202,200	141,200	166,000	- 36,200	24,800

Total Southern Portion of Study Area

Irrigated lands	254,400	181,300	194,200	- 60,200	12,900
Urban-suburban areas	<u>5,100</u>	<u>15,100</u>	<u>40,900</u>	<u>35,800</u>	<u>25,800</u>
TOTALS	259,500	196,400	235,100	- 24,400	38,700

Total Study Area

Irrigated lands	280,700	--	204,700	- 76,000	--
Urban-suburban areas	<u>6,700</u>	--	<u>44,200</u>	<u>37,500</u>	--
TOTALS	287,400	--	248,900	- 38,500	--



CHAPTER V. SUMMARY OF FINDINGS AND CONCLUSIONS

The results of the 1961 land and water use survey of the southern Lahontan area of California, a comparison with the 1950 and 1957 survey results, and the conclusions drawn from this study are summarized in this chapter.

Summary of Findings

This investigation disclosed that in 1961 the following land uses and water requirements existed in the area of investigation:

1. Population in the study area increased from 71,000 in 1950 to 177,000 in 1960, an increase of 149 percent. Growth in the town of Lancaster exceeded that of other areas, increasing from 3,600 persons in 1950 to 26,000 in 1960.

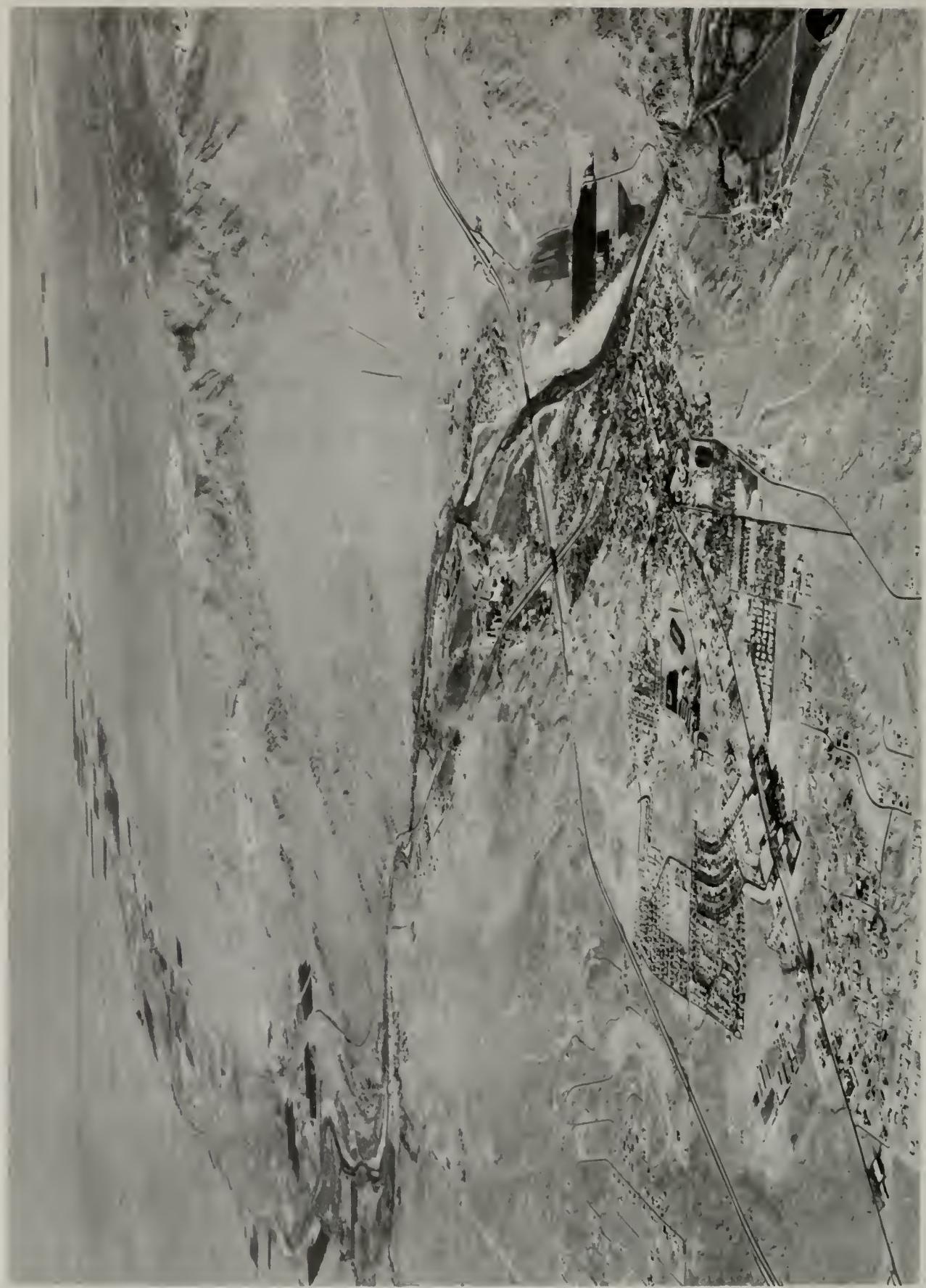
2. A total of 187,500 acres, or about 1 percent of all lands within the survey area, have been developed for urban and suburban uses, or irrigated agriculture uses. This represents a decrease of about 30 percent since the 1950 survey for the northern portion of the area, (that above the Kern-San Bernardino-Inyo county line), and an increase of 64 percent since the 1957 survey in the southern portion.

3. The gross urban and suburban area was slightly more than 98,000 acres in 1961. In the northern part of the investigational area, the gross urban and suburban water service areas increased from about 800 acres in 1950 to 5,300 acres in 1961. In the southern portion of the study area the gross urban and suburban water service area increased from about 17,100 acres in 1957 to 92,800 acres in 1961. These values include vacant land undergoing subdivision.

MOJAVE RIVER VALLEY

Photography by Fairchild Aerial Surveys

Cultural development is mainly confined to valley areas where ground water supplies are available.



4. The gross irrigated agricultural area in the southern portion of the study area was about 83,000 acres in 1961, a decrease of approximately 8 percent over the 90,000 acres that existed in 1957. The northern portion contained about 6,300 acres of irrigated agriculture, approximately 9,300 acres, or nearly 60 percent less than the 1950 total.

5. About 248,900 acre-feet was the estimated net mean seasonal level of water used by water-using developments. Overall net water use decreased about 38,500 acre-feet or 13 percent between 1950 to 1961, mainly as a result of decreases in irrigated agriculture. The acreage of agricultural lands under irrigation in the Owens River and Mono Lake Units during any year is dependent on operations of the City of Los Angeles. Therefore, the acreage in irrigated agriculture in these units is subject to wide fluctuations from year to year, and the 13 percent decrease in net water use between 1950 and 1961 reported herein is not representative of actual conditions prevailing between the survey years because, as indicated earlier, 1961 was a dry year, with precipitation only about 46 percent of the 50-year normal. Urban requirements have gone up considerably, but they have only a minor effect upon the total picture because they constitute but 18 percent of the total net water requirements of the area.

Conclusions

Based on the results of this investigation, it is concluded that:

1. Where an adequate supply of water is available, cultural development has occurred and has been sustained in the southern Lahontan area.

2. Trends regarding land and water use along with population growth patterns are not firm enough to predict with precision the water supplies that will be needed in the future. Therefore, future land use surveys will be needed.

APPENDIX A

DEFINITION OF TERMS USED IN REPORT



APPENDIX A

DEFINITION OF TERMS USED IN REPORT

Annual - The 12-month period from January 1 of a given year through December 31 of the same year, sometimes termed the "calendar year".

Applied Water - Water delivered to a farmer's headgate, in the case of irrigation use, or to an individual's meter in the case of urban use, or the equivalent. Applied water does not include direct precipitation.

Average - An arithmetical average relating to a period other than a mean period.

Consumptive Use of Water - Water consumed by vegetative growth in transpiration and building plant tissue, and water evaporated from adjacent soil, from water surface, and from foliage. It also refers to water similarly consumed and evaporated by urban and nonvegetative types of land use.

Hydrographic Unit - A classification, established for purposes of hydrologic study, used in Bulletin No. 2 to designate an area whose boundaries were determined from consideration of water supply and related water service.

Hydrologic Unit* - In this bulletin, a classification embracing one of the following two topographic characteristics, both of which are defined by surface drainage divides:

*The areal designation system, i.e., categorizing areas into units, sub-units, and subareas, is designed to separate data according to areas of hydrologic significance. The system, as developed, does not differentiate between ground water-bearing formations and nonground water-bearing tributary areas, although land use, as inventoried, does differentiate between such boundaries.

- a. In general, the total watershed area, including water-bearing and nonwater-bearing formations, such as the total drainage area of the Ventura River Valley.
- b. In coastal areas, two or more small contiguous watersheds having similar hydrologic characteristics and water supply problems, each watershed being directly tributary to the ocean and all watersheds emanating from one mountain body located immediately adjacent to the ocean.

Hydrologic Subunit* - In this bulletin, a major logical subdivision of a hydrologic unit, including water-bearing and nonwater-bearing formations, best typified by a major tributary of a stream, a major valley, or a plain along a stream containing one or more ground water basins and having closely related geologic, hydrologic, and topographic characteristics.

Hydrologic Subarea* - In this bulletin, a logical subdivision of a hydrologic subunit which may include either water-bearing or nonwater-bearing formations or both. Where possible, a hydrologic subarea includes one known ground water basin and its tributary area; the ground water basin comprising the water-bearing deposits of the subarea. In areas which are essentially nonwater-bearing, the subarea division was based only on surface drainage conditions, and such factors as locations of gaging stations were given due consideration.

*The areal designation system, i.e., categorizing areas into units, subunits, and subareas, is designed to separate data according to areas of hydrologic significance. The system, as developed, does not differentiate between ground water-bearing formations and nonground water-bearing tributary areas, although land use, as inventoried, does differentiate between such boundaries.

Mean - An arithmetical average relating to a mean period.

Mean Period - A period chosen to represent conditions of water supply and climate over a long series of years. For the current investigation, the mean precipitation period embraces the 50 seasons from 1897-98 through 1946-47.

Net Water Use - That portion of the water historically applied, or estimated to have been applied, which is consumptively utilized for beneficial purposes or otherwise irrecoverably lost. It does not include that portion of the applied water that is subject to possible reuse.

Present - Land use and water use and supply conditions prevailing during the 1960-61 season.

Seasonal - Any 12-month period other than the calendar year.

Water Requirement - The water needed to provide for all beneficial uses and for all irrecoverable losses incidental to such uses. Water requirement includes the portion supplied from direct precipitation.

Water Use - Water use includes all employments of water by nature or man, whether consumptive or nonconsumptive, as well as irrecoverable losses of water incidental to such employment, and is synonymous with the term "water utilization".

APPENDIX B

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA, IN 1961

**LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961**

In acres

Category and class of land use		Mono	Adobe	Hydrologic	Hydrologic	Long	Upper	Owens	Lower	Owens	Centennial	Owens	Hydrologic Unit
	Urban and Suburban	Unit	Unit	Unit	Unit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Total Unit
<u>WATER SERVICE AREA</u>													
Residential		80	0	150	700	310	0	0	0	0	0	0	1,160
Recreational residential		120	0	270	40	30	0	0	0	0	0	0	340
Commercial		30	0	70	150	80	0	0	0	0	0	0	300
Industrial		0	0 ^a	0	20	20	0	0	0	0	0	0	40
Unsegregated urban and suburban area		20	-	20	580	310	0	0	0	0	0	0	910
Subtotals		250	0	510	1,490	750	0	0	0	0	0	0	2,750
Included Nonwater Service Area		70	-	110	810	490	0	0	0	0	0	0	1,410
Gross Urban and Suburban Area		320	0	620	2,300	1,240	0	0	0	0	0	0	4,160
<u>Irrigated Agriculture</u>													
Alfalfa		0	0	0	0	1,040	340	0	0	0	0	0	1,380
Pasture		0	0	0	0	2,180	310	0	0	0	0	0	2,490
Citrus and subtropical		0	0	0	0	0	0 ^a	0	0	0	0	0	0
Truck crops		0	0	0	0	0	0	0	0	0	0	0	0
Field crops		0	0	0	0	50	0	0	0	0	0	0	50
Deciduous fruits and nuts		0	0	0	0	30	0	0	0	0	0	0	30
Small grains		0	0	0	0	0	0	0	0	0	0	0	0
Vineyards		0	0	0	0	0	0	0	0	0	0	0	0
Subtotals		0	0	0	0	3,300	650	0	0	0	0	0	3,950
Fallow		0	0	0	0	20	0	0	0	0	0	0	20
Included Nonwater Service Area		0	0	0	0	520	390	0	0	0	0	0	910
Gross Irrigated Agriculture		0	0	0	0	3,840	1,040	0	0	0	0	0	4,880
GROSS WATER SERVICE AREA		320	0	620	6,140	2,280	0	0	0	0	0	0	9,040
<u>NONWATER SERVICE AREA</u>													
Nonirrigated Agriculture		0	0	2,680 ^b	12,240 ^b	1,610 ^b	0	0	0	0	0	0	16,530
Native Vegetation		189,970	38,650	86,980 ^c	265,230 ^d	346,170 ^e	31,470	0	0	0	0	0	729,850
Unclassified		237,890	158,780	158,340	659,110	451,350	43,800	0	0	0	0	0	1,312,600
GROSS NONWATER SERVICE AREA		427,860	197,430	248,000	936,580	799,130	75,270	0	0	0	0	0	2,058,980
TOTALS		428,180	197,430	248,620	942,720	801,410	75,270	0	0	0	0	0	2,068,020

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	In acres			Eureka Hydrologic Unit			Saline Hydrologic Unit		
	: Fish Lake	: Deep	: Springs	: Marble	: Eureka	Total	: Saline	: Cameo	Total
Urban and Suburban	Hydrologic Unit	Hydrologic Unit	Hydrologic Unit	Subunit	Unit	Subunit	Subunit	Subunit	Unit
Residential	10	0	0	0	0	0	0	0	0
Commercial	0	0	10	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0
Unsegregated urban and suburban area	10	10	0	0	0	0	0	0	0
Subtotals	20	20	0	0	0	0	0	0	0
Included Nonwater Service Area	— ^a	10	0	0	0	0	0	0	0
Gross Urban and Suburban Area	20	30	0	0	0	0	0	0	0
<u>Irrigated Agriculture</u>									
Alfalfa	550	90	0	0	0	0	0	0	0
Pasture	310	0	0	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0	0	0	0
Field crops	0	0	0	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0	0	0	0
Small grains	0	0	0	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0	0	0	0
Subtotals	860	90	0	0	0	0	0	0	0
Fallow	0	0	0	0	0	0	0	0	0
Included Nonwater Service Area	170	40	0	0	0	0	0	0	0
Gross Irrigated Agriculture	1,030	130	0	0	0	0	0	0	0
GROSS WATER SERVICE AREA	1,050	160	0	0	0	0	0	0	0
<u>NONWATER SERVICE AREA</u>									
Nonirrigated Agriculture	0	0	0	0	0	0	0	0	0
Native Vegetation	45,720	26,680	5,550	118,770	124,320	137,440	8,400	145,840	0
Unclassified	134,920	100,310	9,840	238,220	248,060	311,280	17,350	329,330	
GROSS NONWATER SERVICE AREA	180,640	126,990	15,390	356,990	372,380	449,420	25,750	475,170	
TOTALS	181,690	127,150	15,390	356,990	372,380	449,420	25,750	475,170	

OF THE SOUTHERN LAKEPORT AREA IN 1961
(continued)

In acres

Category and class of land use	Subunit	Race Track	Race	Track Hydrologic Unit		Amargosa Hydrologic Unit					
				Hidden Valley	Ulida Subunit	Sand Flat Subunit	Total Unit	Death Valley Subunit	Harrisburgh Subarea	Wingate Wash Subarea	Subarea
<u>WATER SERVICE AREA</u>											
Urban and Suburban											
Residential	0	0	0	0	0	0	0	40	0	0	0
Recreational residential	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	30	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0
Unsegregated urban and suburban area	0	0	0	0	0	0	0	40	0	0	0
Subtotals	0	0	0	0	0	0	0	110	0	0	0
Included Nonwater Service Area	0	0	0	0	0	0	0	30	0	0	0
Gross Urban and Suburban Area	0	0	0	0	0	0	0	140	0	0	0
<u>Irrigated Agriculture</u>											
Alfalfa	0	0	0	0	0	0	0	0	0	0	0
Pasture	0	0	0	0	0	0	0	10	0	0	0
Citrus and subtropical	0	0	0	0	0	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0	0	40	0	0	0
Field crops	0	0	0	0	0	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0	0	0	0	0	0
Small grains	0	0	0	0	0	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0	0	0	0	0	0
Subtotals	0	0	0	0	0	0	0	50	0	0	0
Fallow	0	0	0	0	0	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	0	0	0	0	0	0
Gross Irrigated Agriculture	0	0	0	0	0	0	0	50	0	0	0
GROSS WATER SERVICE AREA	0	0	0	0	0	0	0	190	0	0	0
<u>NONWATER SERVICE AREA</u>											
Nonirrigated Agriculture	0	0	0	0	0	0	0	856,400	0	7,230	0
Native Vegetation	17,650	4,850	2,360	2,490	27,350	856,400	856,400	1,089,660	14,760	36,050	0
Unclassified	23,200	13,960	2,900	10,240	51,000	1,089,660	1,089,660	1,089,660	1,089,660	47,150	
GROSS NONWATER SERVICE AREA	40,850	18,810	5,260	13,430	78,350	1,246,060	1,246,060	21,290	21,290	83,200	
TOTALS	40,850	18,810	5,260	13,430	78,350	1,246,250	1,246,250	21,990	21,990	83,200	

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961

(continued)

In acres

Category and class of land use	Amargosa Hydrologic Unit (continued)					
	Valjean Subunit	: Furnace Creek Subunit:	Greenwater : Subarea	Furnace Creek : Subarea	Calico : Subarea	Amargosa Subunit
WATER SERVICE AREA						
Urban and Suburban						
Residential	0	0	0	0	0	190
Recreational residential	0	0	0	0	0	0
Commercial	0	0	0	10	0	50
Industrial	0	0	0	0	0	0
Unsegregated urban and suburban area	0	0	0	0	0	— ^a
Subtotals	0	0	0	10	0	240
Included Nonwater Service Area	0	190	10	20	— ^a	150
Gross Urban and Suburban Area	0	190	10	30	10	390
Irrigated Agriculture						
Alfalfa	0	0	0	0	0	20
Pasture	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0
Field crops	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0
Small grains	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0
Subtotals	0	0	0	0	0	20
Fallow	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	— ^a
Gross Irrigated Agriculture	0	0	0	0	0	20
GROSS WATER SERVICE AREA	0	190	10	30	10	410
NONWATER SERVICE AREA						
Nonirrigated Agriculture	0	0	0	0	0	0
Native Vegetation	5,180	115,630	247,240	155,000	21,140	39,820
Unclassified	5,780	49,730	152,380	109,280	74,890	24,360
GROSS NONWATER SERVICE AREA	10,960	165,360	406,620	264,280	96,040	48,530
TOTALS	10,960	165,550	406,630	264,310	96,040	48,790

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

Category and class of land use		Subarea	Subarea	In acres			
				Amargosa Hydrologic Unit (con't): Amargosa Subunit	Total Hydrologic Unit: California Unit	Pahrump Unit	Ivanpah Unit
WATER SERVICE AREA							
Urban and Suburban				0	10	240	0
Residential				0	0	0	0
Recreational residential				0	90	0	0
Commercial				0	0	0	0
Industrial				0	50	0	0
Unsegregated urban and suburban area				0	0	0	0
Subtotals				0	10	380	0
Included Nonwater Service Area				0	10	410	0
Gross Urban and Suburban Area				0	20	790	0
Irrigated Agriculture							
Alfalfa				0	20	0	0
Pasture				0	10	0	0
Citrus and subtropical				0	0	0	0
Truck crops				0	40	0	0
Field crops				0	0	0	0
Deciduous fruits and nuts				0	0	0	0
Small grains				0	0	0	0
Vineyards				0	0	0	0
Subtotals				0	70	0	190
Fallow				0	0	0	0
Included Nonwater Service Area				0	0	0	0
Gross Irrigated Agriculture				0	0	70	0
GROSS WATER SERVICE AREA				0	20	860	0
NONWATER SERVICE AREA							
Nonirrigated Agriculture				0	0	1,010	0
Native Vegetation				51,310	1,906,740	93,610	4,860
Unclassified				31,990	1,857,130	31,820	36,520
GROSS NONWATER SERVICE AREA				83,300	3,763,870	125,430	41,380
TOTALS				83,320	3,764,730	125,430	41,380
						278,160	60,240
							101,620

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Hydrologic Unit	Subunit	Nelson Hydrologic Unit	Bicycle Hydrologic Unit	Soldstone Hydrologic Unit	Coyote Hydrologic Unit	Superior Hydrologic Unit
Urban and Suburban							
Residential	0	0	0	0	0	0	0 ^a
Recreational residential	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0
Unsegregated urban and suburban area	0	0	0	0	0	0	0
Subtotals	0	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	0	0
Gross Urban and Suburban Area	0	0	0	0	0	0	0
Irrigated Agriculture							
Alfalfa	0	0	0	0	0	420	0
Pasture	0	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0	0
Field crops	0	0	0	0	0	40	0
Deciduous fruits and nuts	0	0	0	0	0	0	0
Small grains	0	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0	0
Subtotals	0	0	0	0	0	460	0
Fallow	0	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	30	0
Gross Irrigated Agriculture	0	0	0	0	0	490	0
GROSS WATER SERVICE AREA	0	0	0	0	0	500	10
NONWATER SERVICE AREA							
Nonirrigated Agriculture	0	0	0	0	0	80	0
Native Vegetation	13,450	23,930	37,380	57,450	19,320	92,970	67,550
Unclassified	9,130	8,030	17,160	29,590	23,290	73,220	117,030
GROSS NONWATER SERVICE AREA	22,140	22,580	31,960	54,540	87,040	166,270	184,580
TOTALS	99,140	22,580	31,960	54,540	87,050	43,310	166,770
							184,590

OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Panamint Hydrologic Unit					
	Wild	Rose	Subunit	Lee	Rosa	Flat
Wingate	White	Wild	Lee	Santa	Silver	Darwin
Pass	Sage	Rose	Subunit	Rose Flat	Dollar	Subunit
Subunit	Subarea	Subarea	Subarea	Subarea	Subarea	Subarea
WATER SERVICE AREA						
Urban and Suburban						
Residential	0	0	0	0	0	0
Recreational residential	0	0	0	0	0	0
Commercial	0	0	^a	0	0	0
Industrial	0	0	0	0	0	0
Unsegregated urban and suburban area	0	0	0	0	0	30
Subtotals	0	0	- ^a	0	0	30
Included Nonwater Service Area	0	0	- ^a	0	0	40
Gross Urban and Suburban Area	0	0	0	0	0	70
Irrigated Agriculture						
Alfalfa	0	0	0	0	0	0
Pasture	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0
Field crops	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0
Small grains	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0
Subtotals	0	0	0	0	0	0
Fallow	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	0
Gross Irrigated Agriculture	0	0	0	0	0	0
GROSS WATER SERVICE AREA	0	0	0	0	0	0
NONWATER SERVICE AREA						
<u>Nonirrigated Agriculture</u>	0	0	0	0	0	0
<u>Native Vegetation</u>	2,930	3,470	2,770	12,070	3,540	1,870
<u>Unclassified</u>	8,540	14,830	5,950	14,450	13,960	2,830
GROSS NONWATER SERVICE AREA	11,470	18,300	8,720	26,520	28,420	4,700
TOTALS	11,470	18,300	8,720	26,520	28,420	4,700
						131,330

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBBARAES
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Panamint Hydrologic Unit (continued)			Searles Hydrologic Unit		
	Panamint : Subunit	Brown : Subunit	Robbers : Subunit	Total : Unit	Searles : Subunit	Salt Wells : Subunit
<u>WATER SERVICE AREA</u>						
Urban and Suburban						
Residential	a	0	0	a	410	10
Recreational residential	0	0	0	0	0	0
Commercial	a	0	0	50	0	0
Industrial	0	0	0	70	0	0
Unsegregated urban and suburban area	a	0	0	10	0	0
Subtotals	0	0	0	30	540	10
Included Nonwater Service Area	-a	0	40	80	830	120
Gross Urban and Suburban Area	0	0	40	110	1,370	130
<u>Irrigated Agriculture</u>						
Alfalfa	0	0	0	0	0	0
Pasture	0	0	0	0	0	0
Citrus and subtropical	0	0	0	0	0	0
Truck crops	0	0	0	0	0	0
Field crops	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0
Small grains	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0
Subtotals	0	0	0	0	0	0
Fallow	0	0	0	0	0	0
Included Nonwater Service Area	0	0	0	0	0	0
Gross Irrigated Agriculture	0	0	0	0	0	0
GROSS WATER SERVICE AREA	0	0	40	110	1,370	130
<u>NONWATER SERVICE AREA</u>						
Nonirrigated Agriculture	0	0	0	0	0	0
Native Vegetation	233,130	18,660	94,500	426,340	156,120	29,280
Unclassified	271,030	24,890	97,910	616,670	168,060	25,350
GROSS NONWATER SERVICE AREA	560,160	43,550	192,410	1,043,010	324,180	54,630
TOTALS	560,160	43,550	192,450	1,043,120	325,550	54,760
					81,830	81,980
						469,640
						462,290

LAND USE
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Coso Hydrologic Unit			Upper Hydrologic Subunit			Indian Wells Hydrologic Unit		
	Wild Horse	Coso Subunit	Total Unit	Cactus Hydrologic	Rose Subunit	Indian Wells Subunit	Wells Unit	Total Unit	Subunit
WATER SERVICE AREA									
<u>Urban and Suburban</u>									
Residential	0	0	0	0	0	10	1,070	1,080	40
Recreational residential	0	0	0	0	0	10	180	190	10
Commercial	0	0	0	0	0	0	10	10	40
Industrial	0	0	0	0	0	20	470	420	420
Unsegregated urban and suburban area	0	0	0	0	0	40	1,770	1,810	
Subtotals	0	0	0	0	0	50	2,400	2,450	
Included Nonwater Service Area	0	0	0	0	0	90	4,170	4,260	
Gross Urban and Suburban Area	0	0	0	0	0	0	0	0	
<u>Irrigated Agriculture</u>									
Alfalfa	0	0	0	0	0	0	130	130	
Pasture	0	0	0	0	0	0	260	260	
Citrus and subtropical	0	0	0	0	0	0	0	0	
Truck crops	0	0	0	0	0	0	0	0	
Field crops	0	0	0	0	0	0	0	0	
Deciduous fruits and nuts	0	0	0	0	0	0	0	0	
Small grains	0	0	0	0	0	0	0	0	
Vineyards	0	0	0	0	0	0	0	0	
Subtotals	0	0	0	0	0	0	390	390	
Fallow	0	0	0	0	0	0	0	0	
Included Nonwater Service Area	0	0	0	0	0	0	20	20	
Gross Irrigated Agriculture	0	0	0	0	0	0	410	410	
GROSS WATER SERVICE AREA	0	0	0	0	0	90	4,580	4,670	
<u>NONWATER SERVICE AREA</u>									
<u>Nonirrigated Agriculture</u>	0	0	0	0	0	0	560	560	
Native Vegetation	2,660	33,670	36,330	4,480	40,360	271,790	312,150	312,150	
Unclassified	<u>10,080</u>	<u>112,620</u>	<u>122,700</u>	<u>6,190</u>	<u>68,090</u>	<u>277,820</u>	<u>345,290</u>	<u>345,290</u>	
GROSS NONWATER SERVICE AREA	<u>12,740</u>	<u>146,290</u>	<u>159,030</u>	<u>10,670</u>	<u>108,450</u>	<u>250,170</u>	<u>658,620</u>	<u>658,620</u>	
TOTALS	12,740	146,290	159,030	10,670	108,540	554,750	663,290	663,290	

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Fremont Hydrologic Unit						Antelope Hydrologic Unit					
	Dove Springs	Landis Subunit	Kelso Subunit	East Tehachapi Subunit	Koehn Subunit	Total Unit	Chafee Subarea	Gloster Subarea	Willow Springs Subarea	Antelope Subunit	Subarea	Subarea
<u>WATER SERVICE AREA</u>												
<u>Urban and Suburban</u>												
Residential	0	10	10	300	320	270	10	10	0	0	0	0
Residential Residential	0	0	0	0	0	0	0	0	0	30	30	0
Commercial	0	0	0	30	30	80	0	0	0	0	0	0
Industrial	0	0	10	0	10	50	0	0	0	20	20	20
Unsegregated urban and suburban	0	0	20	180	230	40	80	80	80	200	200	200
Subtotals	0	10	70	510	590	440	120	120	120	220	220	220
Included Nonwater Service Area	0	- ^a	220	4,560	4,780	1,270	30	30	30	190	190	190
Gross Urban and Suburban Area	0	10	290	5,070	5,370	1,710	150	150	150	410	410	410
<u>Irrigated Agriculture</u>												
Alfalfa	0	0	280	2,850	3,130	850	90	90	90	1,330	1,330	1,330
Pasture	0	0	0	190	190	0	0	0	0	10	10	10
Citrus and subtropical	0	0	0	0	0	0	0	0	0	0	0	0
Truck crops	0	0	180	0	180	0	0	0	0	10	10	270
Field crops	0	0	40	20	60	0	0	0	0	0	0	0
Deciduous fruits and nuts	0	0	0	0	0	0	0	0	0	10	10	0
Small grains	0	0	0	180	180	0	0	0	0	0	0	0
Vineyards	0	0	0	0	0	0	0	0	0	0	0	0
Subtotals	0	0	500	3,240	3,740	850	120	120	120	1,600	1,600	1,600
Fallow	0	0	80	0	80	0	0	0	0	0	0	0
Included Nonwater Service Area	0	0	180	220	400	50	10	10	10	80	80	80
Gross Irrigated Agriculture	0	0	760	3,460	4,220	900	130	130	130	1,680	1,680	1,680
GROSS WATER SERVICE AREA	0	10	1,050	8,530	9,590	2,610	280	280	280	2,090	2,090	2,090
<u>NONWATER SERVICE AREA</u>												
Nonirrigated Agriculture	0	80	3,260	7,100	10,440	0	50	50	50	800	800	800
Native Vegetation	10,880	11,300	6,540	202,540	231,260	56,000	21,360	21,360	21,360	67,130	67,130	67,130
Unclassified	15,680	12,680	46,850	255,840	331,050	7,120	18,790	18,790	18,790	42,290	42,290	42,290
GROSS NONWATER SERVICE AREA	26,560	24,070	56,650	465,480	572,750	63,120	40,200	40,200	40,200	110,220	110,220	110,220
TOTALS	26,560	24,070	57,700	474,010	582,340	65,730	40,480	40,480	40,480	112,310	112,310	112,310

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use	Antelope Hydrologic Unit (continued)				Total : Unit : Subarea :	Cuddeback :Hydrologic Unit : Subarea :		
	Antelope Subunit (continued)							
	North : Muroc : Subarea :	Buttes : Subarea :	Rock : Creek : Subarea :	Total : Unit : Subarea :				
WATER SERVICE AREA								
Urban and Suburban								
Residential	10	4,420	1,390	250	570	6,920		
Recreational residential	10	10	0	0	220	270		
Commercial	0	530	230	10	60	910		
Industrial	0	60	10	0	0	140		
Unsegregated urban and suburban area	280	<u>3,280</u>	<u>180</u>	<u>380</u>	<u>830</u>	<u>5,270</u>		
Subtotals	300	8,300	1,810	640	1,680	13,510		
Included Nonwater Service Area	<u>60</u>	<u>8,240</u>	<u>2,240</u>	<u>1,420</u>	<u>960</u>	<u>14,410</u>		
Gross Urban and Suburban Area	360	16,540	4,050	2,060	2,640	27,920		
IRRIGATED AGRICULTURE								
Alfalfa	2,060	33,180	1,300	660	1,550	41,020		
Pasture	120	<u>2,030</u>	10	40	260	<u>2,470</u>		
Citrus and subtropical	0	0	0	0	10	0		
Truck crops	950	640	130	0	50	2,050		
Field crops	470	1,640	80	40	30	2,260		
Deciduous fruits and nuts	10	480	10	20	870	1,400		
Small grains	2,060	2,720	0	100	10	4,890		
Vineyards	0	<u>60</u>	<u>0</u>	<u>0</u>	<u>60</u>	<u>0</u>		
Subtotals	5,670	40,750	1,530	860	2,780	54,160		
Fallow	1,480	840	0	30	^a <u>1,970</u>	^a <u>2,350</u>		
Included Nonwater Service Area	<u>920</u>	<u>3,120</u>	<u>180</u>	<u>140</u>	<u>1,970</u>	<u>6,770</u>		
Gross Irrigated Agriculture	<u>8,070</u>	<u>44,710</u>	<u>1,710</u>	<u>1,330</u>	<u>4,750</u>	<u>63,280</u>		
GROSS WATER SERVICE AREA	8,430	61,250	5,760	3,390	7,390	91,200		
NONWATER SERVICE AREA								
Nonirrigated Agriculture	47,290	62,620	1,230	2,040	1,760	115,790		
Native vegetation	65,480	191,960	154,570	50,060	133,670	740,230		
Unclassified	<u>55,730</u>	<u>238,570</u>	<u>129,620</u>	<u>34,880</u>	<u>100,870</u>	<u>627,870</u>		
GROSS NONWATER SERVICE AREA	<u>168,500</u>	<u>493,150</u>	<u>285,420</u>	<u>86,980</u>	<u>236,300</u>	<u>1,483,890</u>		
TOTALS	176,930	554,400	291,180	90,370	243,690	1,575,090		

LAND USE IN HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS
OF THE SOUTHERN LAHONTAN AREA IN 1961
(continued)

In acres

Category and class of land use		Mojave Hydrologic Unit						Troy Subunit
		El Mirage:	Upper:	Middle:	Harper Subunit	Lower:	Mojave:	
	Subunit:	MoJave:	Subunit:	Subarea:	Subarea:	Subarea:	Subarea:	Subarea:
<u>WATER SERVICE AREA</u>								
Urban and Suburban								
Residential		340	5,860	790	0	0	1,120	0
Residential residential		280	3,230	0	0	0	0	70
Commercial		20	540	100	0	0	210	0
Industrial		0	90	10	0	0	50	0
Unsegregated urban and suburban area		160	1,880	710	0	160	460	160
Subtotals		800	11,600	1,610	0	160	1,840	0
Included Nonwater Service Area		310	29,070	2,540	0	240	2,880	0
Gross Urban and Suburban Area		1,110	40,670	4,150	0	400	4,720	0
<u>Irrigated Agriculture</u>								
Alfalfa		300	3,870	2,950	0	300	1,140	0
Pasture		160	880	870	0	210	210	60
Citrus and subtropical		0	0	0	0	0	0	0
Truck crops		60	130	10	0	10	0	0
Field crops		30	420	190	0	0	150	0
Deciduous fruits and nuts		10	60	0	0	0	150	0
Small grains		0	30	10	0	0	10	0
Vineyards		0	0	0	0	0	0	0
Subtotals		560	5,390	4,030	0	510	1,670	0
Fallow		0	170	70	0	50	10	0
Included Nonwater Service Area		80	550	220	0	30	100	0
Gross Irrigated Agriculture		640	6,110	4,320	0	520	1,780	0
GROSS WATER SERVICE AREA		1,750	46,780	8,470	0	990	6,500	0
<u>NONWATER SERVICE AREA</u>								
Nonirrigated Agriculture		0	2,250	3,060	0	910	1,080	0
Native Vegetation		73,420	329,480	250,100	17,520	282,(30	126,560	4,210
Unclassified		22,660	171,820	99,790	25,720	118,080	59,140	8,330
GROSS NONWATER SERVICE AREA		96,080	503,550	352,950	43,240	401,720	186,780	12,540
TOTALS		97,830	550,330	361,420	43,240	402,710	193,280	228,280
								229,430

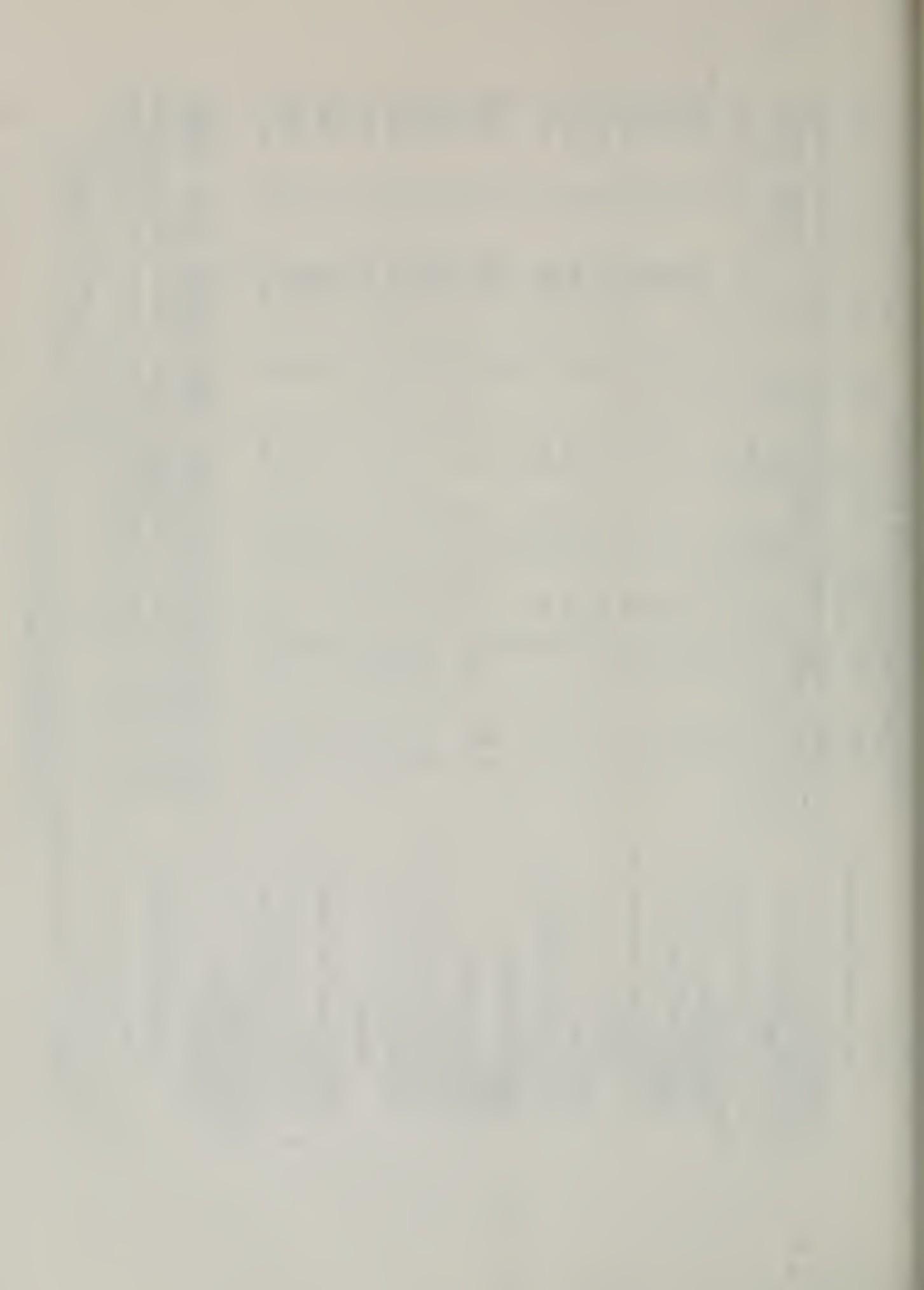
In acres

Category and class of land use	Mohave Hydrologic Unit (continued)						Broadwell : Total Hydrologic: Investigation Unit
	Afton Subunit	Baker Subunit	Silver Soda	Kelso	Total	Unit	
Caves	Cronese	Langford	Lake	Subunit	Subunit	:	
Subarea	Subarea	Subarea	Subarea	Subarea	Subarea	:	
WATER SERVICE AREA							
<u>Urban and Suburban</u>							
Residential	0	0	130	0	30	10	18,650
Recreational residential	0	0 ^a	0	0	0	0	4,280
Commercial	10	0	20	0	30	10	2,590
Industrial	0	0	20	0	0	0	440
Unsegregated urban and suburban area	<u>30</u>	<u>0</u>	<u>60</u>	<u>0</u>	<u>—</u>	<u>—</u>	<u>10,730</u>
Subtotals	40	0	230	0	60	10	36,690
Included Nonwater Service Area	<u>30</u>	<u>10</u>	<u>300</u>	<u>10</u>	<u>50</u>	<u>30</u>	<u>35,790</u>
Gross Urban and Suburban Area	70	10	530	10	110	40	52,390
Irrigated Agriculture							
<u>Alfalfa</u>	620	0	0	0	0	0	56,410
Pasture	0	0	0	0	0	2,390	8,120
Citrus and subtropical	0	0	0	0	0	0	10
Truck crops	0	0	0	0	10	0	2,490
Field crops	0	0	0	0	0	790	0
Deciduous fruits and nuts	0	0	0	0	0	220	3,390
Small grains	0	0	0	0	0	220	1,650
Vinyards	0	0	0	0	0	50	5,120
Subtotals	620	0	0	0	10	0	77,250
Fallow	0	0	0	0	0	0	
Included Nonwater Service Area	<u>30</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2,750</u>
Gross Irrigated Agriculture	<u>650</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10</u>	<u>0</u>	<u>9,390</u>
GROSS WATER SERVICE AREA	720	10	530	10	120	40	67,070
NONWATER SERVICE AREA							
<u>Nonirrigated Agriculture</u>	80	0	0	0	0	7,640	152,050
<u>Native Vegetation</u>	<u>77,590</u>	<u>100,810</u>	<u>25,370</u>	<u>343,640</u>	<u>238,000</u>	<u>2,005,690</u>	<u>82,010</u>
<u>Unclassified</u>	<u>49,900</u>	<u>63,510</u>	<u>19,490</u>	<u>22,380</u>	<u>275,170</u>	<u>169,420</u>	<u>8,118,920</u>
GROSS NONWATER SERVICE AREA	<u>127,570</u>	<u>164,320</u>	<u>44,860</u>	<u>57,590</u>	<u>618,810</u>	<u>407,420</u>	<u>3,245,710</u>
TOTALS	128,290	164,330	45,390	57,600	618,930	407,460	3,312,780
							151,220
							17,068,000

a. Less than five acres.

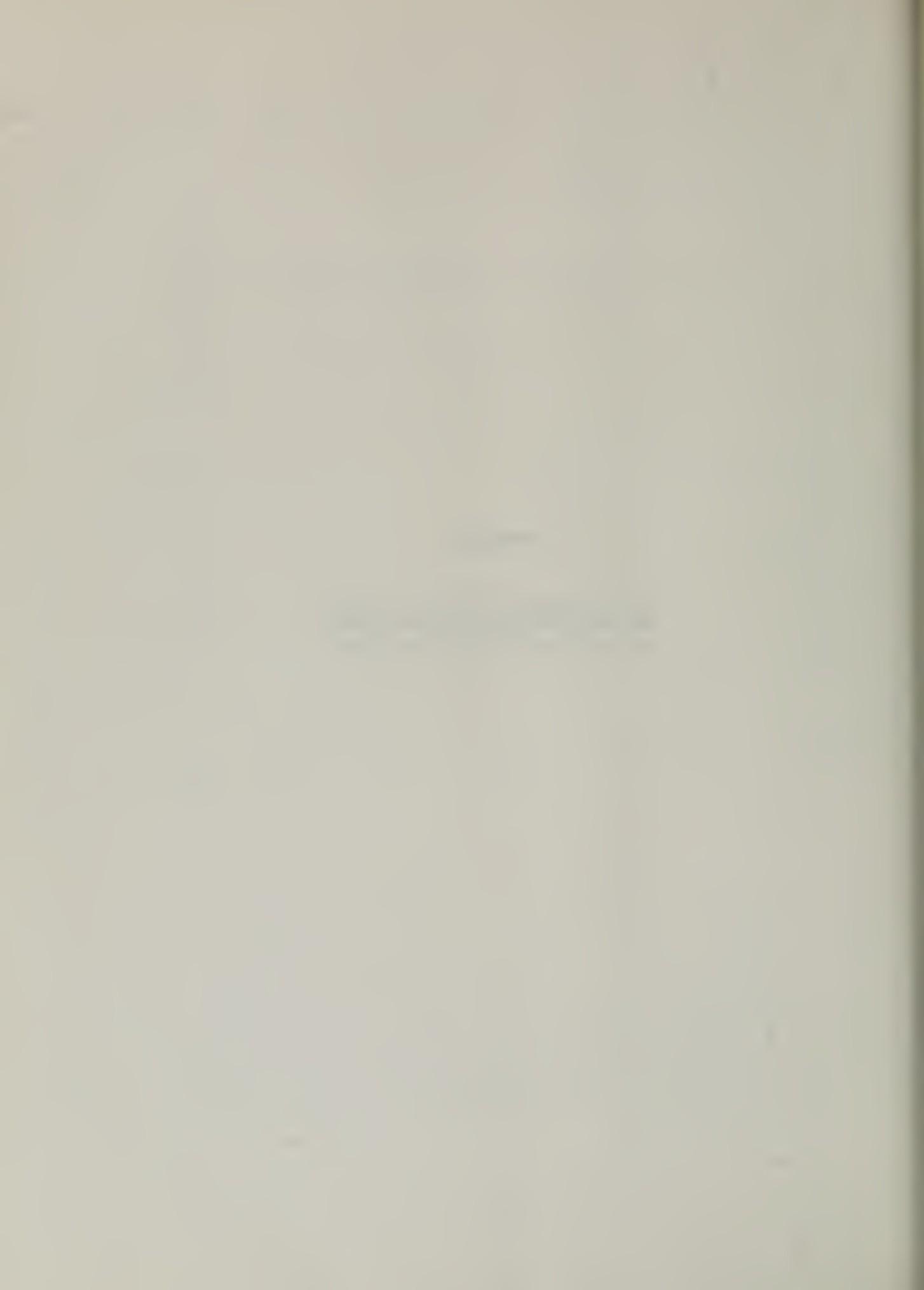
b. Acreage consists of pasture and idle lands which may be irrigated during years of adequate surface water supplies.

c, d, e. Acreage includes approximately 10,100 acres,
2,700 acres, and 1,400 acres, respectively,
of native meadow land.



APPENDIX C

LIST OF DISTRICTS, AREAS, AND UNITS
FOR WHICH INDIVIDUAL TABULATIONS
OF 1961 LAND USES ARE AVAILABLE



APPENDIX C

LIST OF DISTRICTS, AREAS, AND UNITS FOR WHICH INDIVIDUAL TABULATIONS OF 1961 LAND USES ARE AVAILABLE

Utilizing machine techniques that were developed for processing data from this survey, individual tabulations of 1961 land use can be obtained for most of the political and hydrologic subdivisions within the area of investigation. However, reasonable limitations do not permit all these individual tabulations to be published in this report.

For those persons requiring more detailed information, this appendix lists all districts, areas, and units for which 1961 land use can be individually determined and tabulated by machine methods using data available in Department of Water Resources files. It should be noted that data were based on 1961 conditions, including boundaries, and have not been modified to reflect subsequent changes.

Census Tracts	Incorporated Cities
Census Divisions	National Forests
Community Services Districts	Public Utility Districts
County Water Districts	Sanitary Districts
County Water Works Districts	Sanitation Districts
Flood Control Districts	State Parks
	U. S. Geological Survey Quadrangles

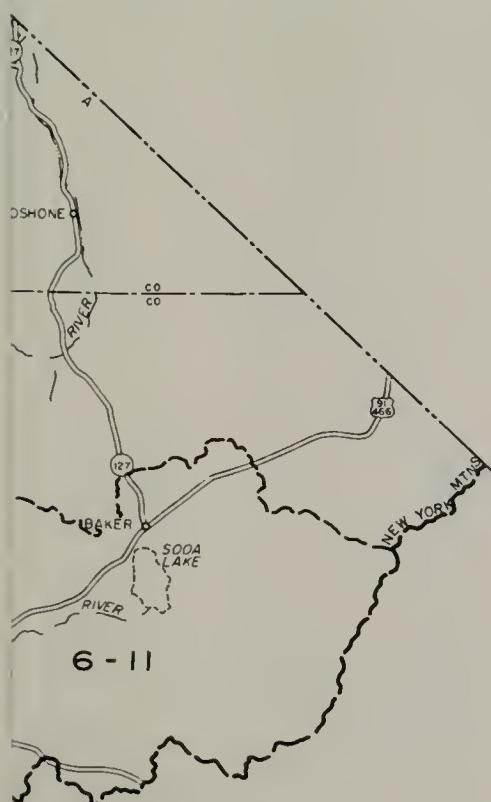
HYDROGRAPHIC AREA AND UNITS

OF LAHONTAN HYDROGRAPHIC AREA

- 7 MONO LAKE UNIT
- 8 ADOBE VALLEY UNIT
- 9 OWENS RIVER UNIT
- 10 DEATH VALLEY UNIT
- 11 MOJAVE RIVER UNIT
- 12 ANTELOPE VALLEY UNIT



LOCATION MAP



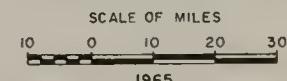
LEGEND

- — — BOUNDARY OF INVESTIGATIONAL AREA
- — — BOUNDARY OF HYDROGRAPHIC UNIT
- 6-8** HYDROGRAPHIC AREA AND UNIT NUMBER

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

**AREA OF INVESTIGATION
AND
HYDROGRAPHIC UNITS**



HYDROGRAPHIC AREA AND UNITS

PORTION OF LAHONTAN HYDROGRAPHIC AREA

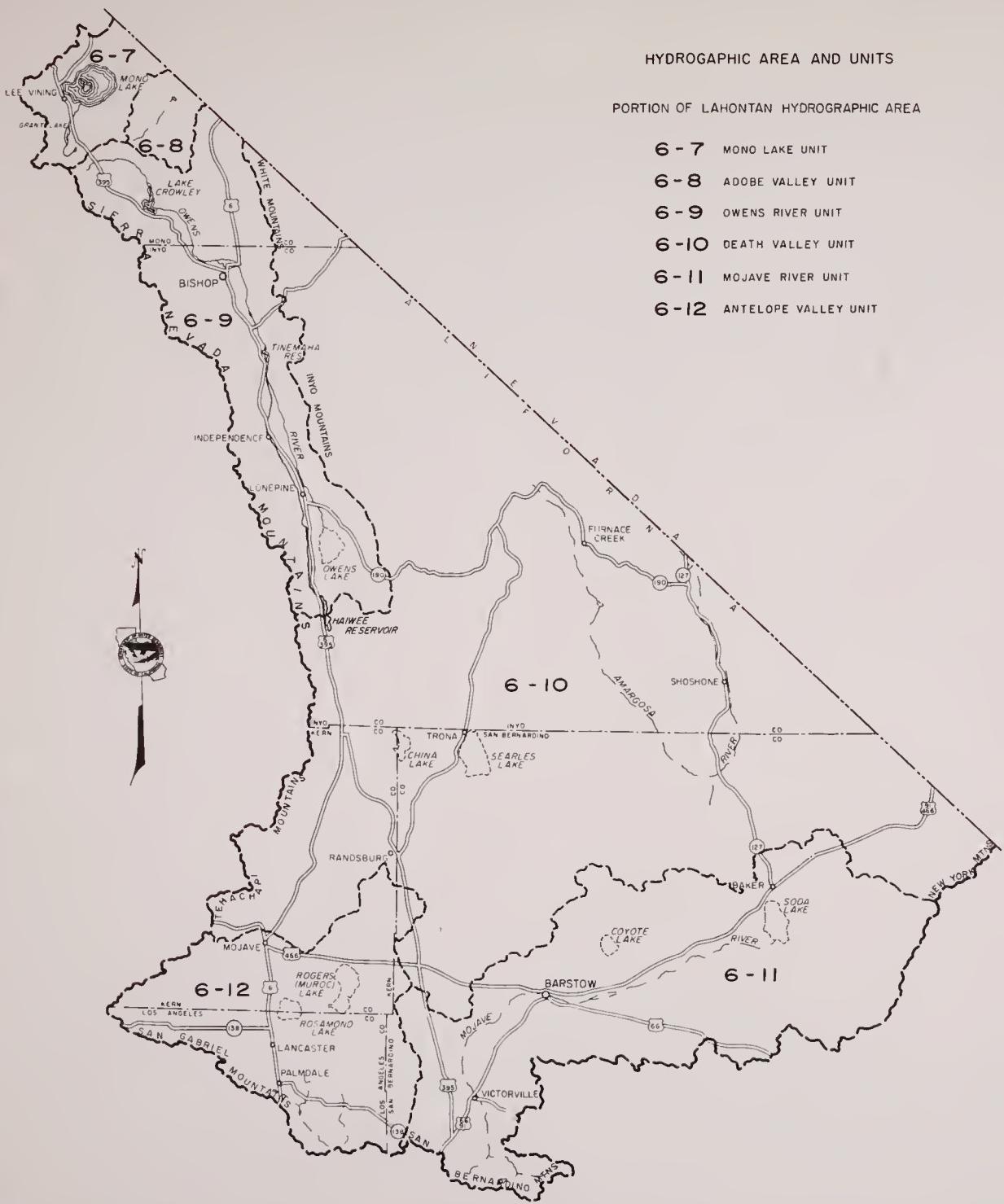
- 6-7** MONO LAKE UNIT
- 6-8** ADOBE VALLEY UNIT
- 6-9** OWENS RIVER UNIT
- 6-10** DEATH VALLEY UNIT
- 6-11** MOJAVE RIVER UNIT
- 6-12** ANTELOPE VALLEY UNIT



LOCATION MAP

LEGEND

- Boundary of investigational area
- - - Boundary of hydrographic unit
- 6-8** Hydrographic area and unit number



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

AREA OF INVESTIGATION
AND
HYDROGRAPHIC UNITS

SCALE OF MILES
10 0 10 20 30
1965



HYDROLOGIC UNITS	
W-01.00	MONO HYDRO UNIT
W-02.00	ADOBE HYDRO UNIT
W-03.00	OWENS HYDRO UNIT LONG HYDRO SUBUNIT UPPER OWENS HYDRO SUBUNIT LOWER OWENS HYDRO SUBUNIT CENTENNIAL HYDRO SUBUNIT
W-04.00	FISH LAKE HYDRO UNIT
W-05.00	DEEP SPRINGS HYDRO UNIT
W-06.00	EUREKA HYDRO UNIT MARBLE BATH HYDRO SUBUNIT EUREKA HYDRO SUBUNIT
W-07.00	SALINE HYDRO UNIT SALINE HYDRO SUBUNIT CAMEO HYDRO SUBUNIT
W-08.00	RACE TRACK HYDRO UNIT RACE TRACK HYDRO SUBUNIT HIDDEN VALLEY HYDRO SUBUNIT ULIDA HYDRO SUBUNIT SAND FLAT HYDRO SUBUNIT
W-09.00	AMARGOSA HYDRO UNIT DEATH VALLEY HYDRO SUBUNIT DEATH VALLEY HYDRO SUBUNIT HARRISBURGH HYDRO SUBUNIT WINGATE WASH HYDRO SUBUNIT VALJEAN HYDRO SUBUNIT AVAWATZ HYDRO SUBUNIT PED PASS HYDRO SUBUNIT VALJEAN HYDRO SUBUNIT SHADOW HYDRO SUBUNIT FURNACE CREEK HYDRO SUBUNIT FURNACE CREEK HYDRO SUBUNIT GREENWATER HYDRO SUBUNIT AMARGOSA HYDRO SUBUNIT CALICO HYDRO SUBUNIT ANARGOSA HYDRO SUBUNIT CHICAGO HYDRO SUBUNIT CALIFORNIA HYDRO SUBUNIT
W-10.00	PAHRUMP HYDRO UNIT
W-11.00	MESQUITE HYDRO UNIT
W-12.00	IVANPAH HYDRO UNIT
W-13.00	OWLSEAD HYDRO UNIT LOST LAKE HYDRO SUBUNIT OWLSEAD HYDRO SUBUNIT
W-14.00	LEACH HYDRO UNIT
W-15.00	NELSON HYDRO UNIT MCLEAN HYDRO SUBUNIT NELSON HYDRO SUBUNIT
W-16.00	BICYCLE HYDRO UNIT
W-17.00	GOLDSTONE HYDRO UNIT
W-18.00	COYOTE HYDRO UNIT
W-19.00	SUPERIOR HYDRO UNIT



STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

HYDROLOGIC UNITS, SUBUNITS, AND SUBAREAS

SCALE OF MILES
10 0 10 20 30
1965

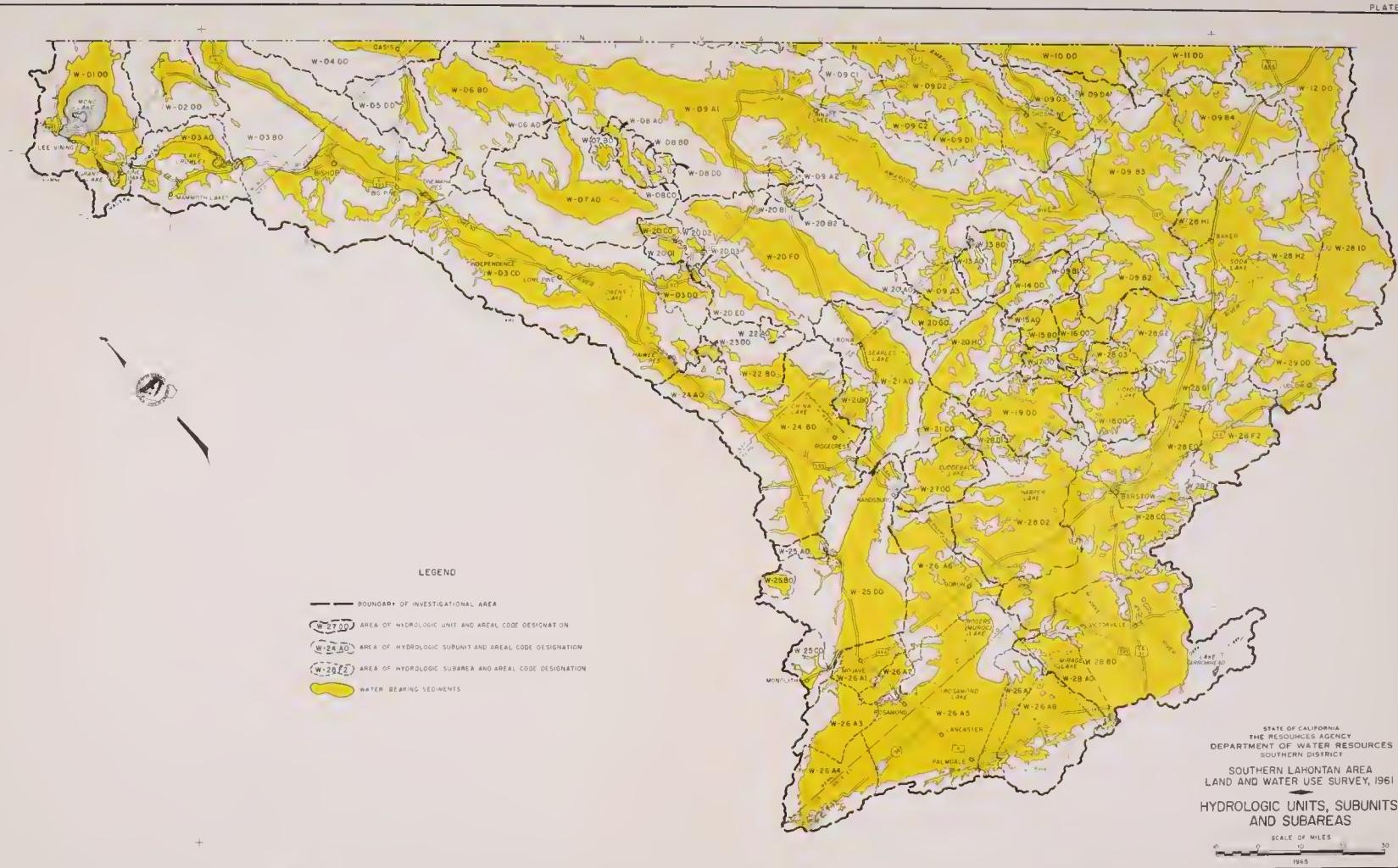


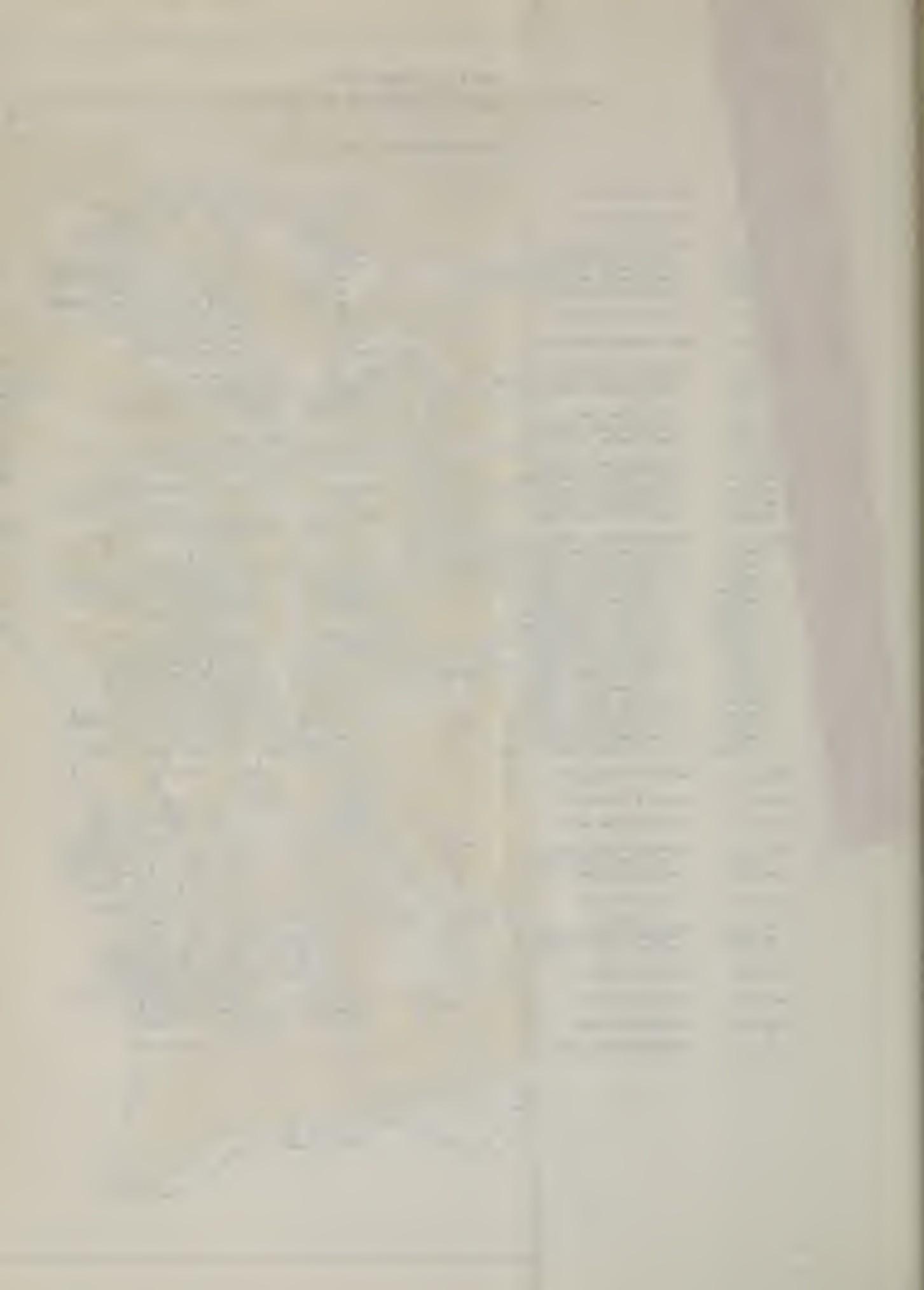
AREAL DESIGNATIONS

HYDROLOGIC UNITS, SUBUNITS AND SUBAREAS

LAHONTAN DRAINAGE PROVINCE

W-01*0	MONO HYDRO UNIT
W-01*0	MONO LAKE
W-02*0	OWENS HYDRO UNIT
W-02*0	LONG HYDRO SUBUNIT
W-03*0	UPPER OWENS HYDRO SUBUNIT
W-03*0	LOWER OWENS HYDRO SUBUNIT
W-03*0	CENTRALINE HYDRO SUBUNIT
W-04*0	FISH LAKE HYDRO UNIT
W-05*0	DEEP SPRINGS HYDRO UNIT
W-06*0	EUREKA HYDRO UNIT
W-06*0	MARBLE BATH HYDRO SUBUNIT
W-06*0	EUREKA HYDRO SUBUNIT
W-07*0	SALIN HYDRO UNIT
W-07*0	SALIN HYDRO SUBUNIT
W-07*0	SHAMPO HYDRO SUBUNIT
W-08*0	RACE TRAIL HYDRO UNIT
W-08*0	RACE TRAIL HYDRO SUBUNIT
W-08*0	HIDDEN VALLEY HYDRO SUBUNIT
W-08*0	ULIDA HYDRO SUBUNIT
W-08*0	SAND FLAT HYDRO SUBUNIT
W-09*0	AMARGOSA HYDRO UNIT
W-09*0	DEATH VALLEY HYDRO SUBUNIT
W-09*0	AMARGOSA HYDRO SUBAREA
W-09*0	WINGATE WASH HYDRO SUBAREA
W-09*0	VALJEAN HYDRO SUBUNIT
W-09*0	AVAWAZ HYDRO SUBAREA
W-09*0	RED CLOUD HYDRO SUBAREA
W-09*0	VALJEAN HYDRO SUBAREA
W-09*0	SHADON HYDRO SUBAREA
W-09*0	FURNACE CREEK HYDRO SUBUNIT
W-09*0	GREENWATER HYDRO SUBAREA
W-09*0	AMARGOSA HYDRO SUBUNIT
W-09*0	ALICIA HYDRO SUBAREA
W-09*0	AMARGOSA RIVER SUBAREA
W-09*0	CHICAGO HYDRO SUBAREA
W-09*0	CALIFORNIA HYDRO SUBAREA
W-10*0	PAHRUMP HYDRO UNIT
W-11*0	HFSCOUTE HYDRO UNIT
W-12*0	IVANPAH HYDRO UNIT
W-13*0	OWLSHEAD HYDRO UNIT
W-13*0	LOST LAKE HYDRO SUBUNIT
W-13*0	OWLSHEAD HYDRO SUBUNIT
W-14*0	LEACE HYDRO UNIT
W-15*0	NELSON HYDRO UNIT
W-15*0	NELSON HYDRO SUBUNIT
W-16*0	RICYCLE HYDRO UNIT
W-17*0	GOLDSTONE HYDRO UNIT
W-18*0	FOYOTE HYDRO UNIT
W-19*0	SUPERIOR HYDRO UNIT
W-20*0	PANAMINT HYDRO UNIT
W-20*0	WINGATE PASS HYDRO SUBUNIT
W-20*0	MILD ROSE HYDRO SUBUNIT
W-20*0	WILDFLOWERS HYDRO SUBAREA
W-20*0	LEE FLAT HYDRO SUBUNIT
W-20*0	SANTA ROSA FLAT HYDRO SUBUNIT
W-20*0	ULLUCA HYDRO SUBAREA
W-20*0	RAINBOW HYDRO SUBAREA
W-20*0	SILVER DOLLAR HYDRO SUBAREA
W-20*0	DARLON HYDRO SUBUNIT
W-20*0	PLAUM HYDRO SUBUNIT
W-20*0	BROWN HYDRO SUBUNIT
W-20*0	ROBBERS HYDRO SUBUNIT
W-21*0	SEARLES HYDRO UNIT
W-21*0	SEARLES HYDRO SUBUNIT
W-21*0	SALT WELLS HYDRO SUBUNIT
W-21*0	PILOT KNOB HYDRO SUBUNIT
W-22*0	COSO HYDRO UNIT
W-22*0	WILD HORSE HYDRO SUBUNIT
W-22*0	COSO HYDRO SUBUNIT
W-23*0	UPPER CACTUS HYDRO UNIT
W-24*0	INDIAN WELLS HYDRO UNIT
W-24*0	ROSE HYDRO SUBUNIT
W-24*0	INDIAN WELLS HYDRO SUBUNIT
W-25*0	FREIGHT HYDRO UNIT
W-25*0	DOVE SPRINGS HYDRO SUBUNIT
W-25*0	FELSO LANGIS HYDRO SUBUNIT
W-25*0	FAST TEHACHAPI HYDRO SUBUNIT
W-25*0	YEHOM HYDRO SUBUNIT
W-26*0	ANTELOPE HYDRO UNIT
W-26*0	ANTELOPE HYDRO SUBUNIT
W-26*0	CHAFEE HYDRO SUBAREA
W-26*0	DAIRY MEADOWS HYDRO SUBAREA
W-26*0	WILLOW SPRINGS HYDRO SUBAREA
W-26*0	NEENACH HYDRO SUBAREA
W-26*0	LANCASTER HYDRO SUBAREA
W-26*0	NEWTON HYDRO SUBAREA
W-26*0	BUTTES HYDRO SUBAREA
W-26*0	ROCK CREEK HYDRO SUBAREA
W-27*0	CUODESBAY HYDRO UNIT
W-28*0	MOLAVE HYDRO UNIT
W-28*0	EL MIRAGE HYDRO SUBUNIT
W-28*0	UPPER MOLAVE HYDRO SUBUNIT
W-28*0	MIDDLE MOLAVE HYDRO SUBUNIT
W-28*0	HARPER HYDRO SUBUNIT
W-28*0	GODSS VALLEY HYDRO SUBAREA
W-28*0	HARPER MOUNTAIN HYDRO SUBUNIT
W-28*0	LOWER MOJAVE HYDRO SUBUNIT
W-28*0	TROY HYDRO SUBUNIT
W-28*0	YANKEE WASH HYDRO SUBAREA
W-28*0	TROY MOUNTAIN HYDRO SUBAREA
W-28*0	AFTON HYDRO SUBUNIT
W-28*0	CAVES HYDRO SUBAREA
W-28*0	CHEMES HYDRO SUBAREA
W-28*0	LANDORD HYDRO SUBAREA
W-28*0	BAKER HYDRO SUBUNIT
W-28*0	SILVER LAKE HYDRO SUBAREA
W-28*0	SODA LAKE HYDRO SUBAREA
W-28*0	KELSO HYDRO SUBUNIT
W-29*0	BROADWELL HYDRO UNIT

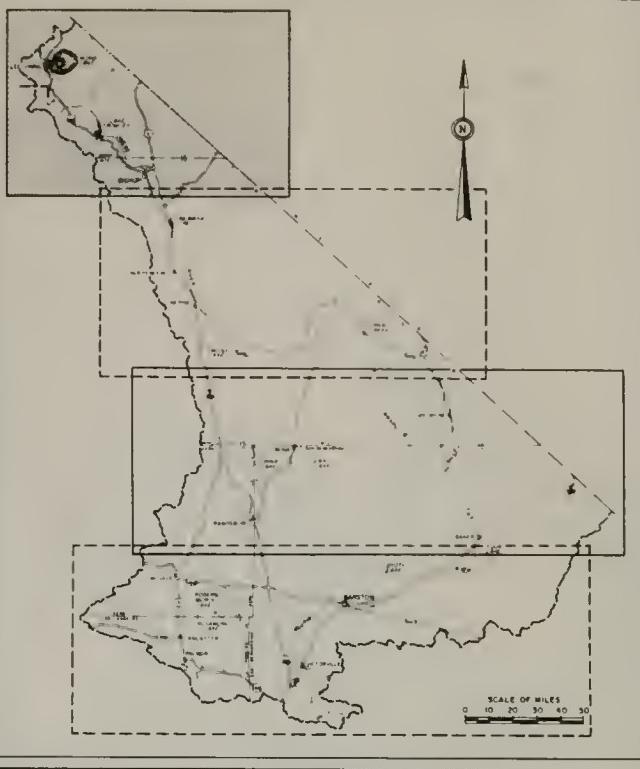




AREAL DESIGNATION
HYDROLOGIC UNITS

LAHONTAN DRAINAGE PROVINCE

- W-01** MONO
W-02 ADOBE
W-03 OWENS
W-04 FISH L.
W-05 DEEP
W-06 EUREKA
W-07 SALINE
W-08 RACE
W-09 AMARG
W-10 PAHRUI
W-11 MESQUITE
W-12 IVANPAH
W-13 OWL SH.
W-14 LEACH
W-15 NELSON
W-16 BICYCLE
W-17 GOLDS
W-18 COYOTE
W-19 SUPERIOR
W-20 PANAMINT
W-21 SEARL
W-22 COSO
W-23 UPPER
W-24 INDIAN
W-25 FREMO
W-26 ANTEL
W-27 CUDDE
W-28 MOJAV
W-29 BROAD



LOCATION MAP

LEGEND

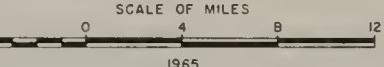
- Boundary of investigational area
- Boundary of hydrologic unit
- Boundary of federal and state lands
- [Green box] IRRIGATED AGRICULTURE
- [Yellow box] URBAN RESIDENTIAL
- [Red box] COMMERCIAL
- [Light blue box] INDUSTRIAL-MANUFACTURING AND PROCESSING
- [Dark blue box] INDUSTRIAL-EXTRACTIVE, STORAGE, AND TRANSPORTATION
- [White box] RECREATIONAL RESIDENTIAL

W-05 DRAINAGE PROVINCE (W) AND HYDROLOGIC UNIT DESIGNATION

STATE OF CALIFORNIA
 THE RESOURCES AGENCY
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
 LAND AND WATER USE SURVEY, 1961

PRESENT LAND USE



W-09

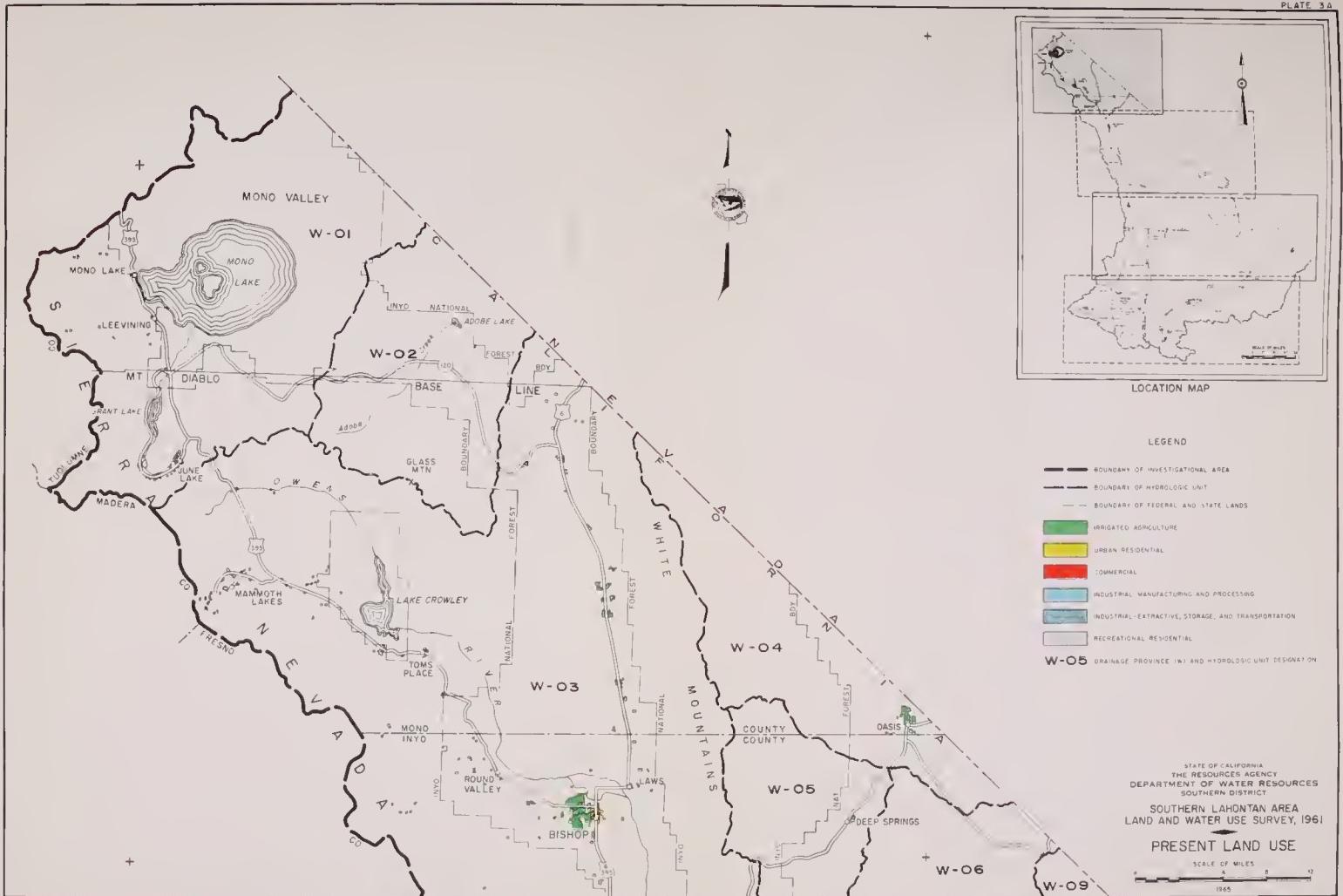
SCALE OF MILES

1965

**AREAL DESIGNATIONS
HYDROLOGIC UNITS**

LAHONTAN DRAINAGE PROVINCE

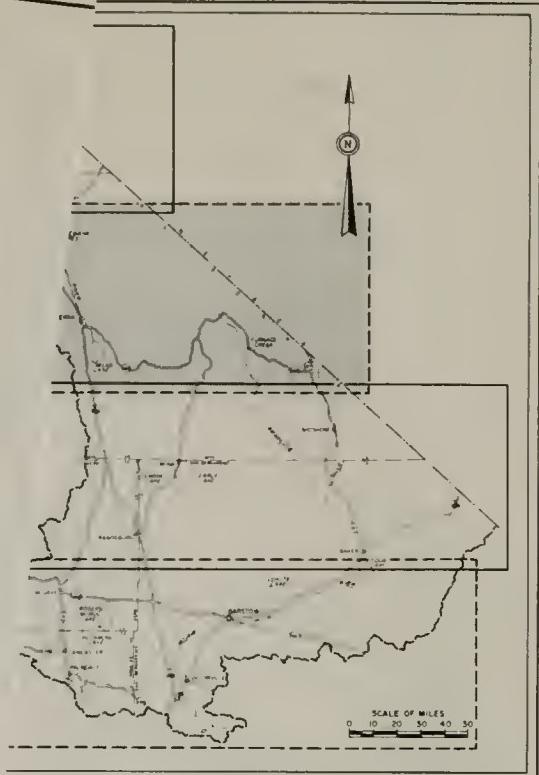
- W-01 MONO HYDROLOGIC UNIT
- W-02 ADOBE HYDROLOGIC UNIT
- W-03 OWENS HYDROLOGIC UNIT
- W-04 FISH LAKE HYDROLOGIC UNIT
- W-05 DEEP SPRINGS HYDROLOGIC UNIT
- W-06 EUREKA HYDROLOGIC UNIT
- W-07 SALINE HYDROLOGIC UNIT
- W-08 RACE TRACK HYDROLOGIC UNIT
- W-09 AMARGOSA HYDROLOGIC UNIT
- W-10 PAHRUMP HYDROLOGIC UNIT
- W-11 MESQUITE HYDROLOGIC UNIT
- W-12 IVANPAH HYDROLOGIC UNIT
- W-13 OWLSEAD HYDROLOGIC UNIT
- W-14 LEACH HYDROLOGIC UNIT
- W-15 NELSON HYDROLOGIC UNIT
- W-16 BICYCLE HYDROLOGIC UNIT
- W-17 GOLDSTONE HYDROLOGIC UNIT
- W-18 COYOTE HYDROLOGIC UNIT
- W-19 SUPERIOR HYDROLOGIC UNIT
- W-20 PANAMINT HYDROLOGIC UNIT
- W-21 SEARLES HYDROLOGIC UNIT
- W-22 COSO HYDROLOGIC UNIT
- W-23 UPPER CACTUS HYDROLOGIC UNIT
- W-24 INDIAN WELLS HYDROLOGIC UNIT
- W-25 FREMONT HYDROLOGIC UNIT
- W-26 ANTELOPE HYDROLOGIC UNIT
- W-27 CUODEBACK HYDROLOGIC UNIT
- W-28 MOJAVE HYDROLOGIC UNIT
- W-29 BROADWELL HYDROLOGIC UNIT



AREAL DESIGNATION
HYDROLOGIC UNITS

LAHONTAN DRAINAGE PROVINCE

- W-01** MONO H
W-02 ADOBE
W-03 OWENS
W-04 FISH L
W-05 DEEP
W-06 EUREK
W-07 SALIN
W-08 RACE
W-09 AMAR
W-10 PAHR
W-11 MESQ
W-12 IVAN
W-13 OWL
W-14 LEA
W-15 NEL
W-16 BIC
W-17 GO
W-18 CO
W-19 SU
W-20 PA
W-21 SE
W-22 C
W-23 U
W-24 I
W-25 R
W-26
W-27
W-28
W-29
- MOUNTAINS
- BOUNDARY
- MONUMENT
- DEATH
- 190



LOCATION MAP

LEGEND

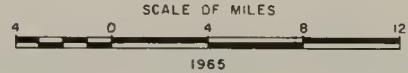
- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC UNIT
- - - BOUNDARY OF FEDERAL AND STATE LANDS
- [Green square] IRRIGATED AGRICULTURE
- [Yellow square] URBAN RESIDENTIAL
- [Red square] COMMERCIAL
- [Light blue square] INDUSTRIAL-MANUFACTURING AND PROCESSING
- [Medium blue square] INDUSTRIAL-EXTRACTIVE, STORAGE, AND TRANSPORTATION
- [Gray square] RECREATIONAL RESIDENTIAL

V-09 DRAINAGE PROVINCE (W) AND HYDROLOGIC UNIT DESIGNATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

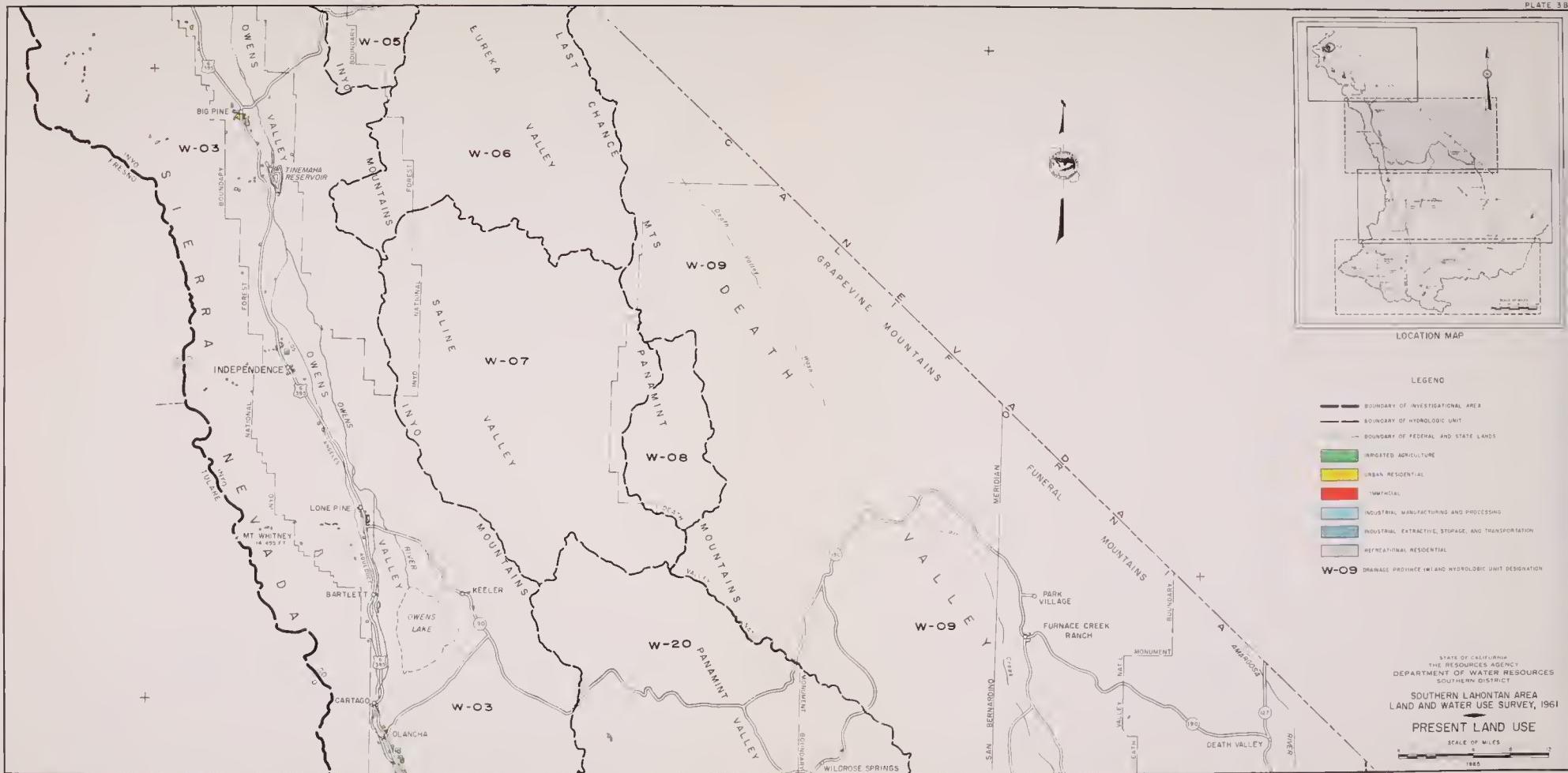
PRESENT LAND USE

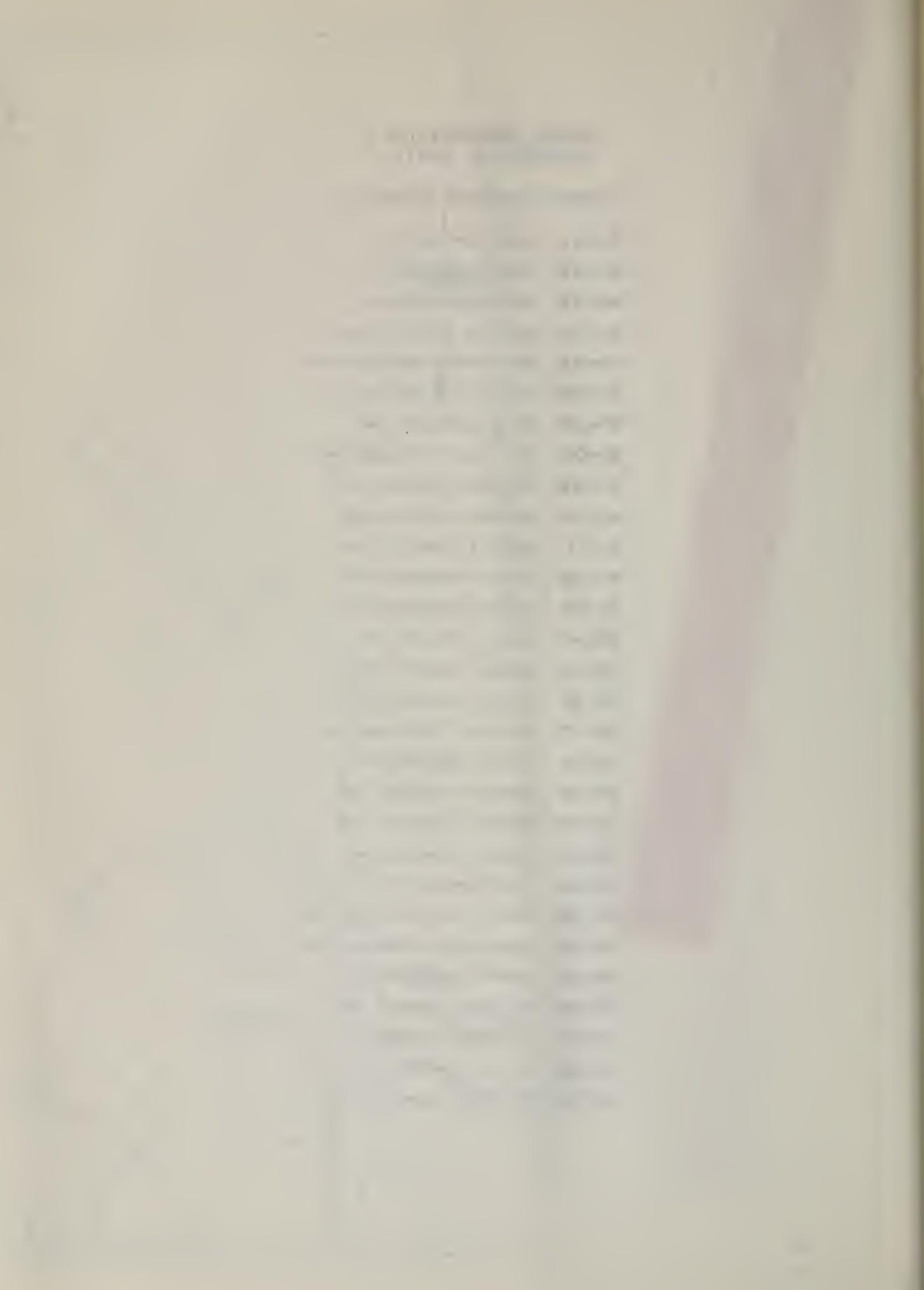


AREAL DESIGNATIONS
HYDROLOGIC UNITS

LAHONTAN DRAINAGE PROVINCE

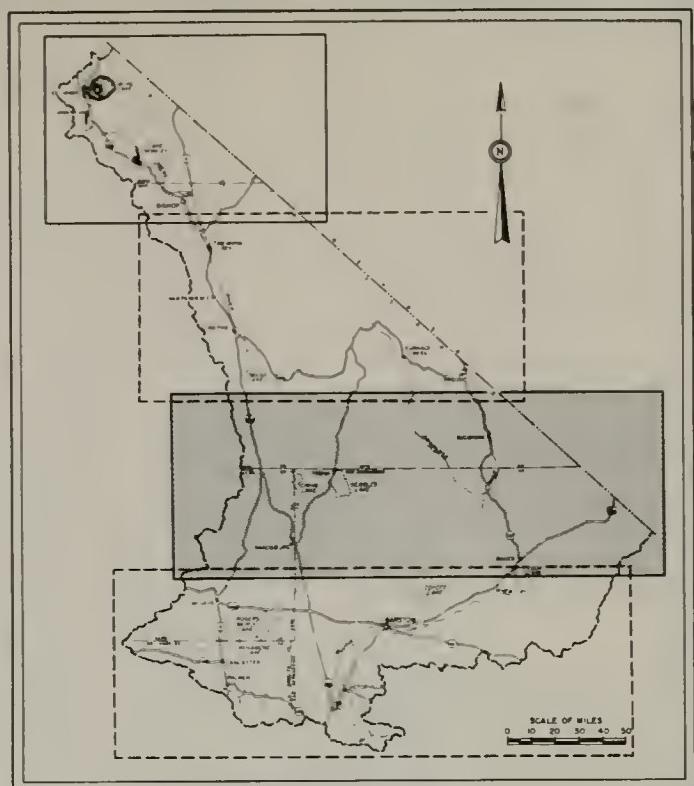
- W-01 MONO HYDROLOGIC UNIT
- W-02 ACODE HYDROLOGIC UNIT
- W-03 OWENS HYDROLOGIC UNIT
- W-04 FISH LAKE HYDROLOGIC UNIT
- W-05 DEEP SPRINGS HYDROLOGIC UNIT
- W-06 EUREKA HYDROLOGIC UNIT
- W-07 SALINE HYDROLOGIC UNIT
- W-08 RACE TRACK HYDROLOGIC UNIT
- W-09 AMARGOSA HYDROLOGIC UNIT
- W-10 PAHRUMP HYDROLOGIC UNIT
- W-11 MESQUITE HYDROLOGIC UNIT
- W-12 IVANPAH HYDROLOGIC UNIT
- W-13 OWLSEAD HYDROLOGIC UNIT
- W-14 LEACH HYDROLOGIC UNIT
- W-15 NELSON HYDROLOGIC UNIT
- W-16 BICYCLE HYDROLOGIC UNIT
- W-17 GOLDSTONE HYDROLOGIC UNIT
- W-18 COYOTE HYDROLOGIC UNIT
- W-19 SUPERIOR HYDROLOGIC UNIT
- W-20 PANAMINT HYDROLOGIC UNIT
- W-21 SEARLES HYDROLOGIC UNIT
- W-22 COSO HYDROLOGIC UNIT
- W-23 UPPER CACTUS HYDROLOGIC UNIT
- W-24 INDIAN WELLS HYDROLOGIC UNIT
- W-25 FREMONT HYDROLOGIC UNIT
- W-26 ANTELOPE HYDROLOGIC UNIT
- W-27 CUDEBACK HYDROLOGIC UNIT
- W-28 MOJAVE HYDROLOGIC UNIT
- W-29 BROADWELL HYDROLOGIC UNIT



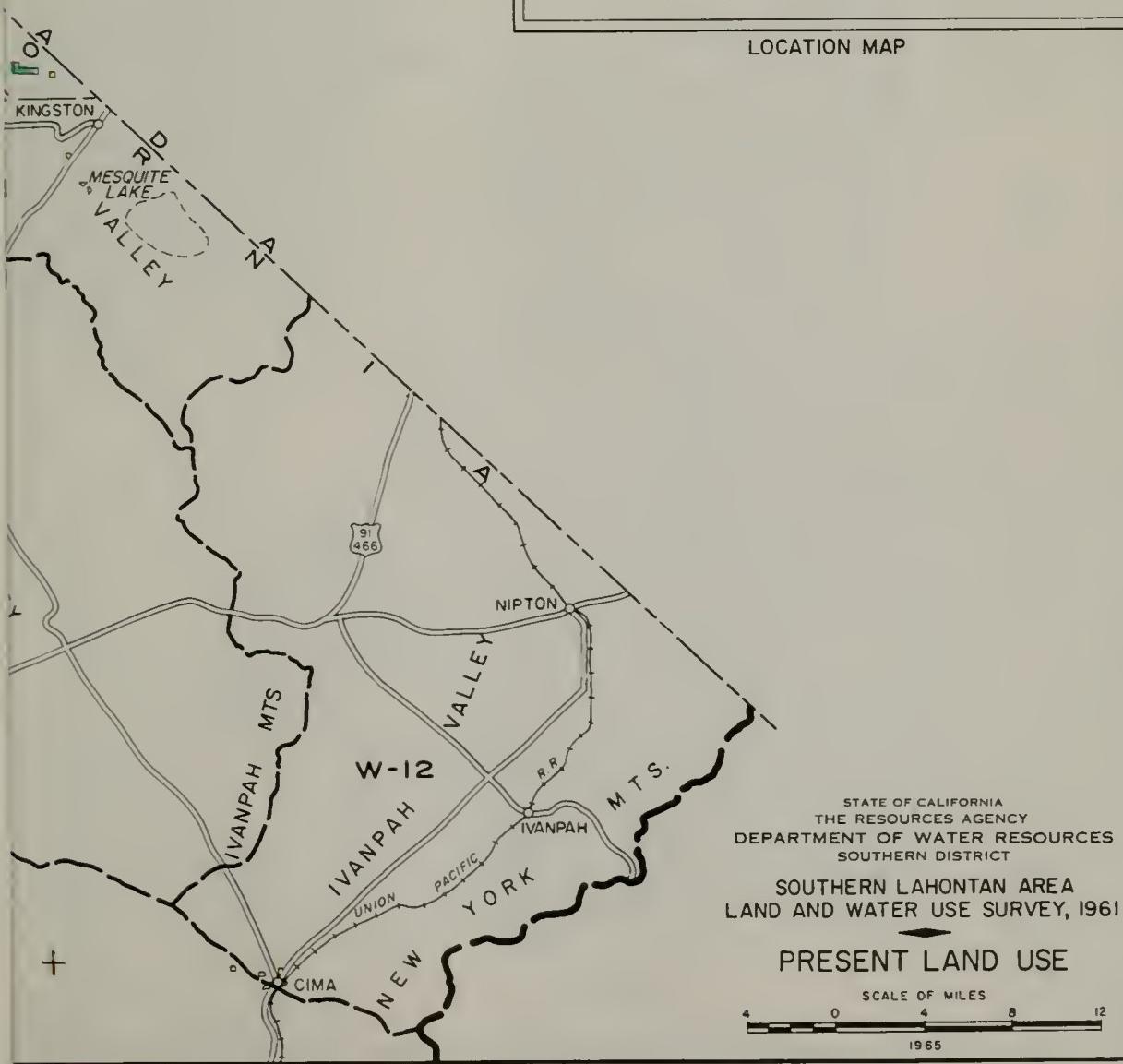


LEGEND

- Boundary of Investigational Area
 - Boundary of Hydrologic Unit
 - Boundary of Federal and State Lands
 - Irrigated Agriculture
 - Urban Residential
 - Urban Residential-less than 10 percent Developed
 - Commercial
 - Industrial-Manufacturing and Processing
 - Industrial-Extractive, Storage, and Transportation
 - Recreational Residential
 - Military Reservations
- W-09** DRAINAGE PROVINCE (W) AND HYDROLOGIC UNIT DESIGNATION



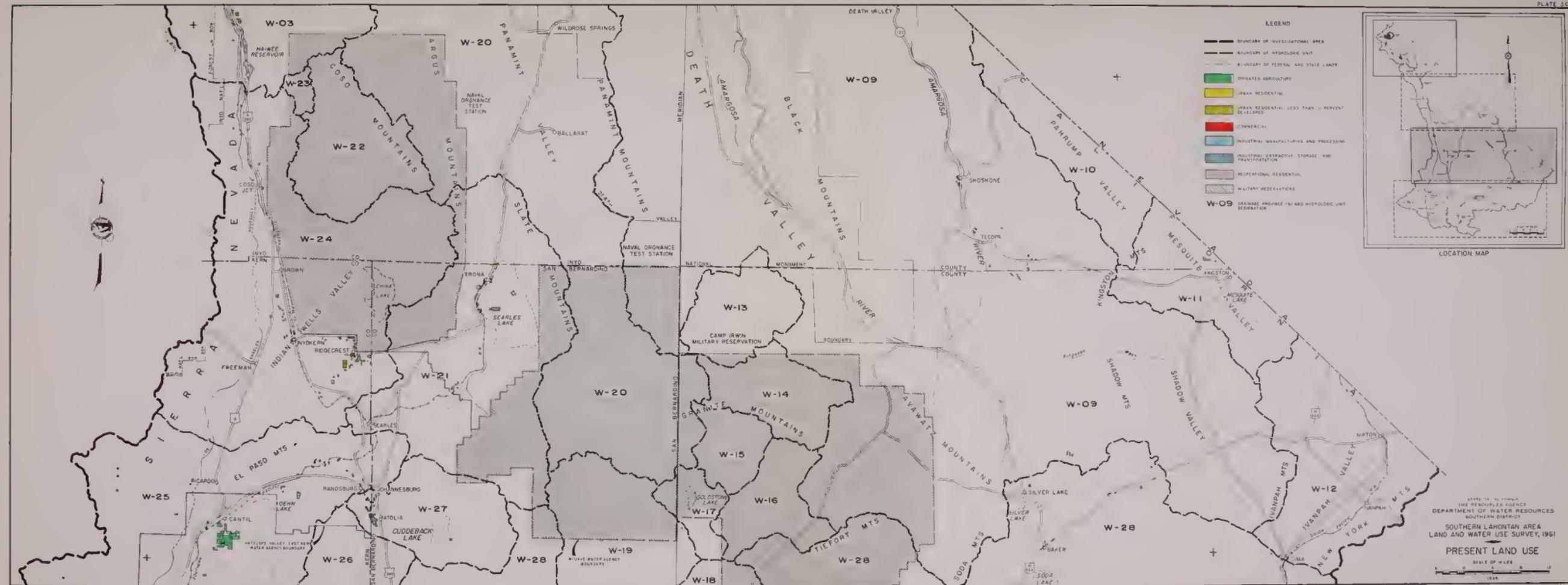
LOCATION MAP



**AREAL DESIGNATIONS
HYDROLOGIC UNITS**

LAHONTAN DRAINAGE PROVINCE

- W-01 MONO HYDROLOGIC UNIT
- W-02 ADDIE HYDROLOGIC UNIT
- W-03 OWENS HYDROLOGIC UNIT
- W-04 FISH LAKE HYDROLOGIC UNIT
- W-05 DEEP SPRINGS HYDROLOGIC UNIT
- W-06 EUREKA HYDROLOGIC UNIT
- W-07 SALINE HYDROLOGIC UNIT
- W-08 RACE TRACK HYDROLOGIC UNIT
- W-09 AMARGOSA HYDROLOGIC UNIT
- W-10 PARTRUMP HYDROLOGIC UNIT
- W-11 MESQUITE HYDROLOGIC UNIT
- W-12 IVANPAH HYDROLOGIC UNIT
- W-13 OWLHEAD HYDROLOGIC UNIT
- W-14 LEACH HYDROLOGIC UNIT
- W-15 NELSON HYDROLOGIC UNIT
- W-16 BICYCLE HYDROLOGIC UNIT
- W-17 GOLDSTONE HYDROLOGIC UNIT
- W-18 COYOTE HYDROLOGIC UNIT
- W-19 SUPERIOR HYDROLOGIC UNIT
- W-20 PANAMINT HYDROLOGIC UNIT
- W-21 SEARLES HYDROLOGIC UNIT
- W-22 COSO HYDROLOGIC UNIT
- W-23 UPPER CACTUS HYDROLOGIC UNIT
- W-24 INDIAN WELLS HYDROLOGIC UNIT
- W-25 FREMONT HYDROLOGIC UNIT
- W-26 ANTELOPE HYDROLOGIC UNIT
- W-27 CUODEBACK HYDROLOGIC UNIT
- W-28 MOJAVE HYDROLOGIC UNIT
- W-29 BROADWELL HYDROLOGIC UNIT





LEGEND

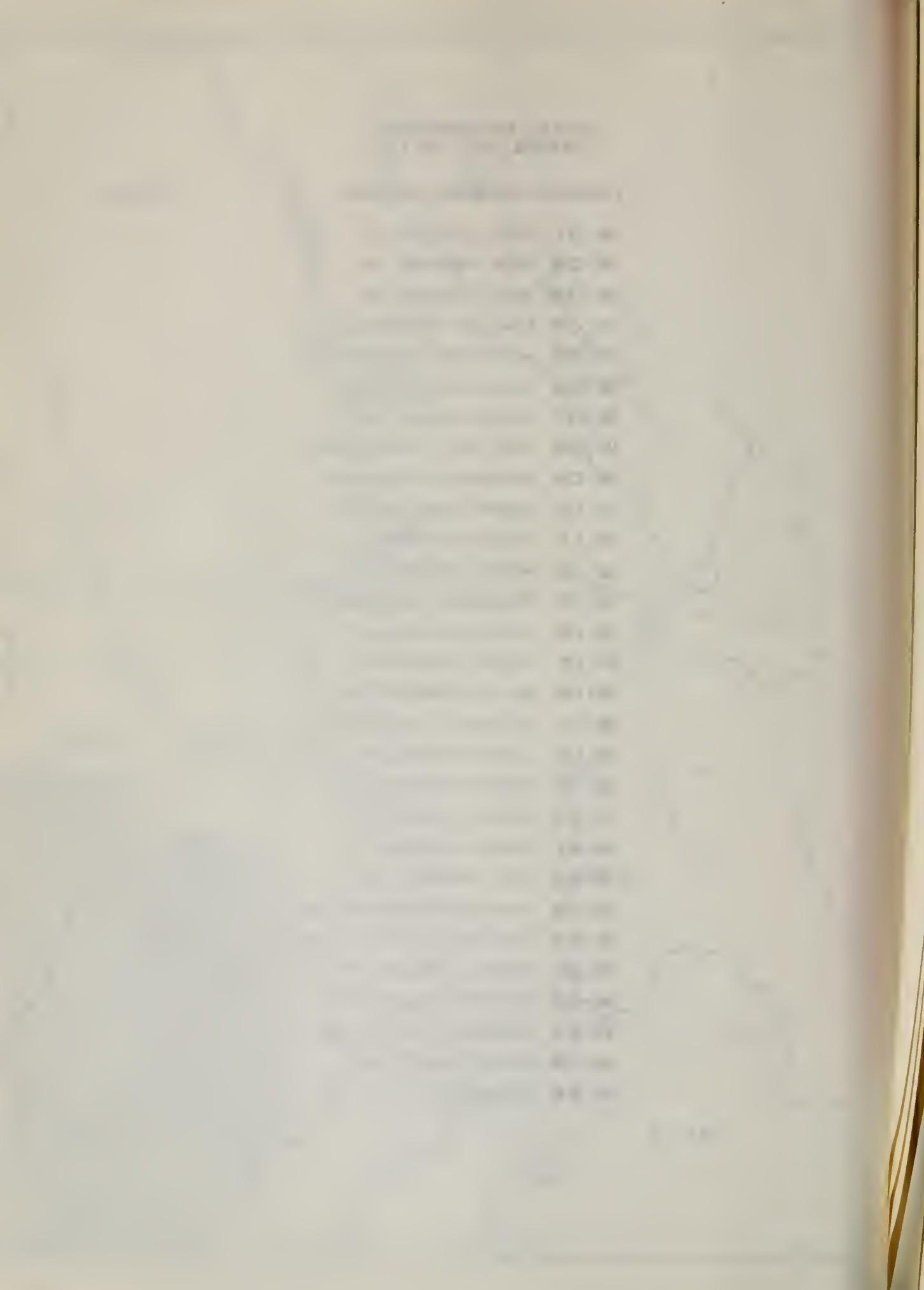
- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF FEDERAL AND STATE LANDS
- IRRIGATED AGRICULTURE
- URBAN RESIDENTIAL
- URBAN RESIDENTIAL - LESS THAN 10 PERCENT DEVELOPED
- COMMERCIAL
- INDUSTRIAL - MANUFACTURING AND PROCESSING
- INDUSTRIAL - EXTRACTIVE, STORAGE, AND TRANSPORTATION
- CREATIONAL RESIDENTIAL
- MILITARY RESERVATIONS
- RAINAGE PROVINCE (W) AND HYDROLOGIC UNIT DESIGNATION

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

PRESENT LAND USE

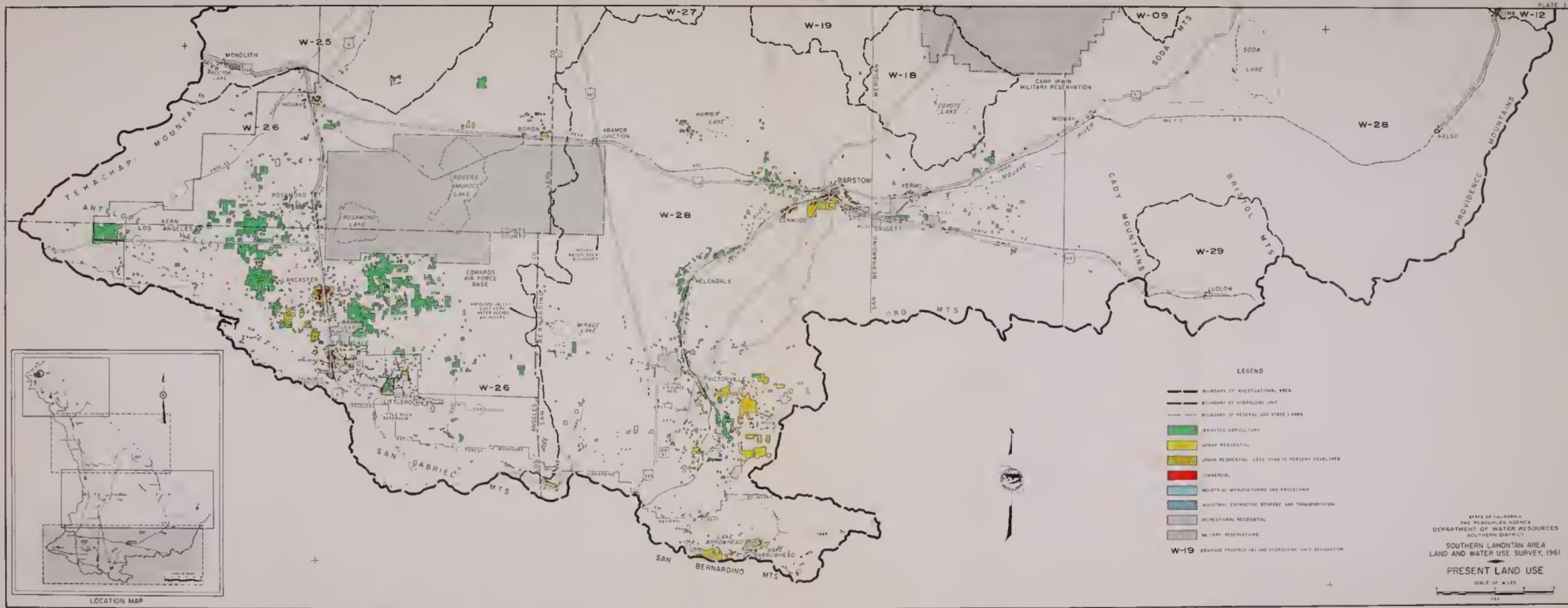


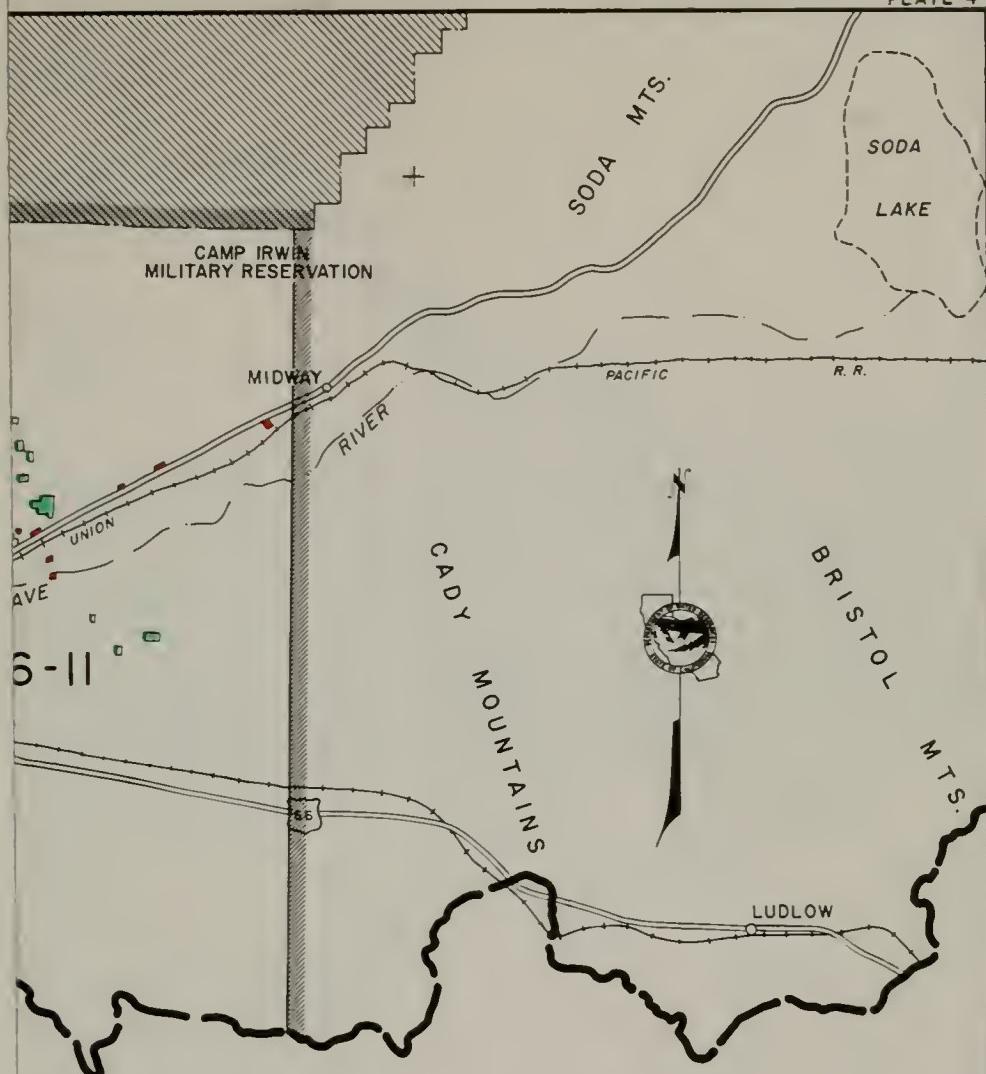


AREAL DESIGNATIONS
HYDROLOGIC UNITS

LAHONTAN DRAINAGE PROVINCE

- W-01 MONO HYDROLOGIC UNIT
- W-02 ADOBE HYDROLOGIC UNIT
- W-03 OWENS HYDROLOGIC UNIT
- W-04 FISH LAKE HYDROLOGIC UNIT
- W-05 DEEP SPRINGS HYDROLOGIC UNIT
- W-06 EUREKA HYDROLOGIC UNIT
- W-07 SALINE HYDROLOGIC UNIT
- W-08 RACE TRACK HYDROLOGIC UNIT
- W-09 ANARGOSA HYDROLOGIC UNIT
- W-10 PAHRUMP HYDROLOGIC UNIT
- W-11 MESQUITE HYDROLOGIC UNIT
- W-12 IVANPAH HYDROLOGIC UNIT
- W-13 OWLSEAD HYDROLOGIC UNIT
- W-14 LEACH HYDROLOGIC UNIT
- W-15 NELSON HYDROLOGIC UNIT
- W-16 BICYCLE HYDROLOGIC UNIT
- W-17 GOLOSTONE HYDROLOGIC UNIT
- W-18 COYOTE HYDROLOGIC UNIT
- W-19 SURPRIOR HYDROLOGIC UNIT
- W-20 PANAMINT HYDROLOGIC UNIT
- W-21 SEARLES HYDROLOGIC UNIT
- W-22 COSO HYDROLOGIC UNIT
- W-23 UPPER CACTUS HYDROLOGIC UNIT
- W-24 INDIAN WELLS HYDROLOGIC UNIT
- W-25 FREMONT HYDROLOGIC UNIT
- W-26 ANTELOPE HYDROLOGIC UNIT
- W-27 CUDDERACK HYDROLOGIC UNIT
- W-28 MOJAVE HYDROLOGIC UNIT
- W-29 BROADWELL HYDROLOGIC UNIT



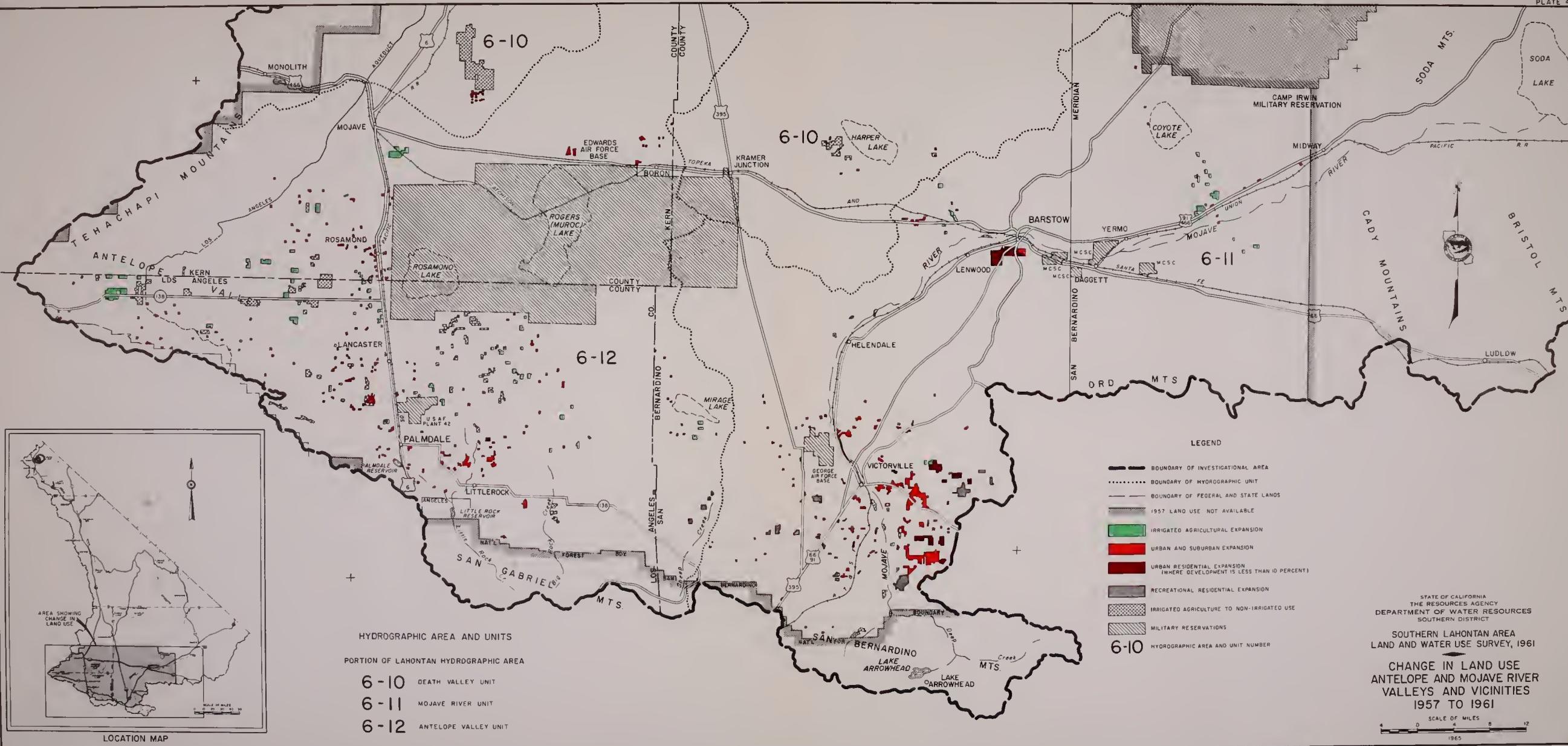


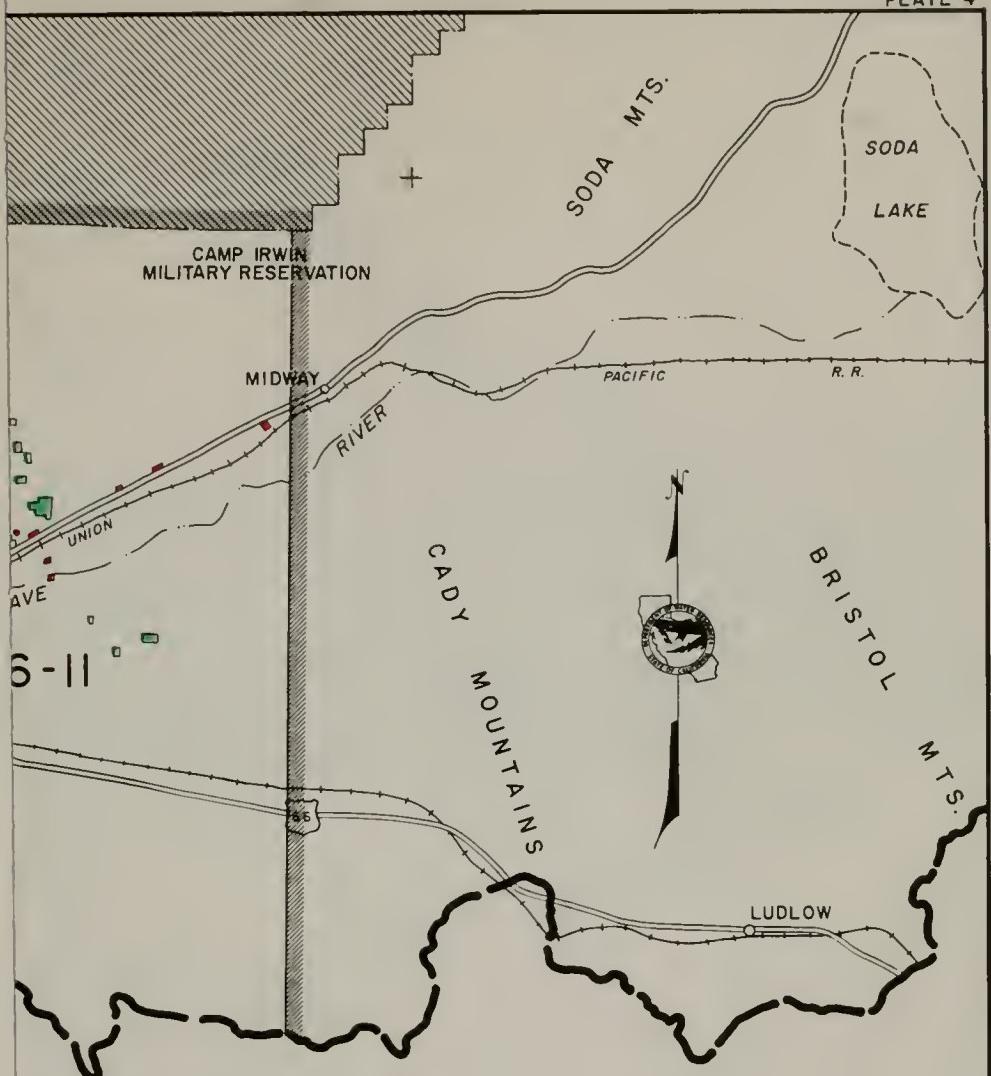
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

SOUTHERN LAHONTAN AREA
LAND AND WATER USE SURVEY, 1961

CHANGE IN LAND USE
ANTELOPE AND MOJAVE RIVER
VALLEYS AND VICINITIES
1957 TO 1961

SCALE OF MILES
4 0 4 8 12
1965





INVESTIGATIONAL AREA
 DROGRAPHIC UNIT
 FEDERAL AND STATE LANDS
 NOT AVAILABLE
 CULTURAL EXPANSION
 URBAN EXPANSION
 (ALL EXPANSION DEVELOPMENT IS LESS THAN 10 PERCENT)

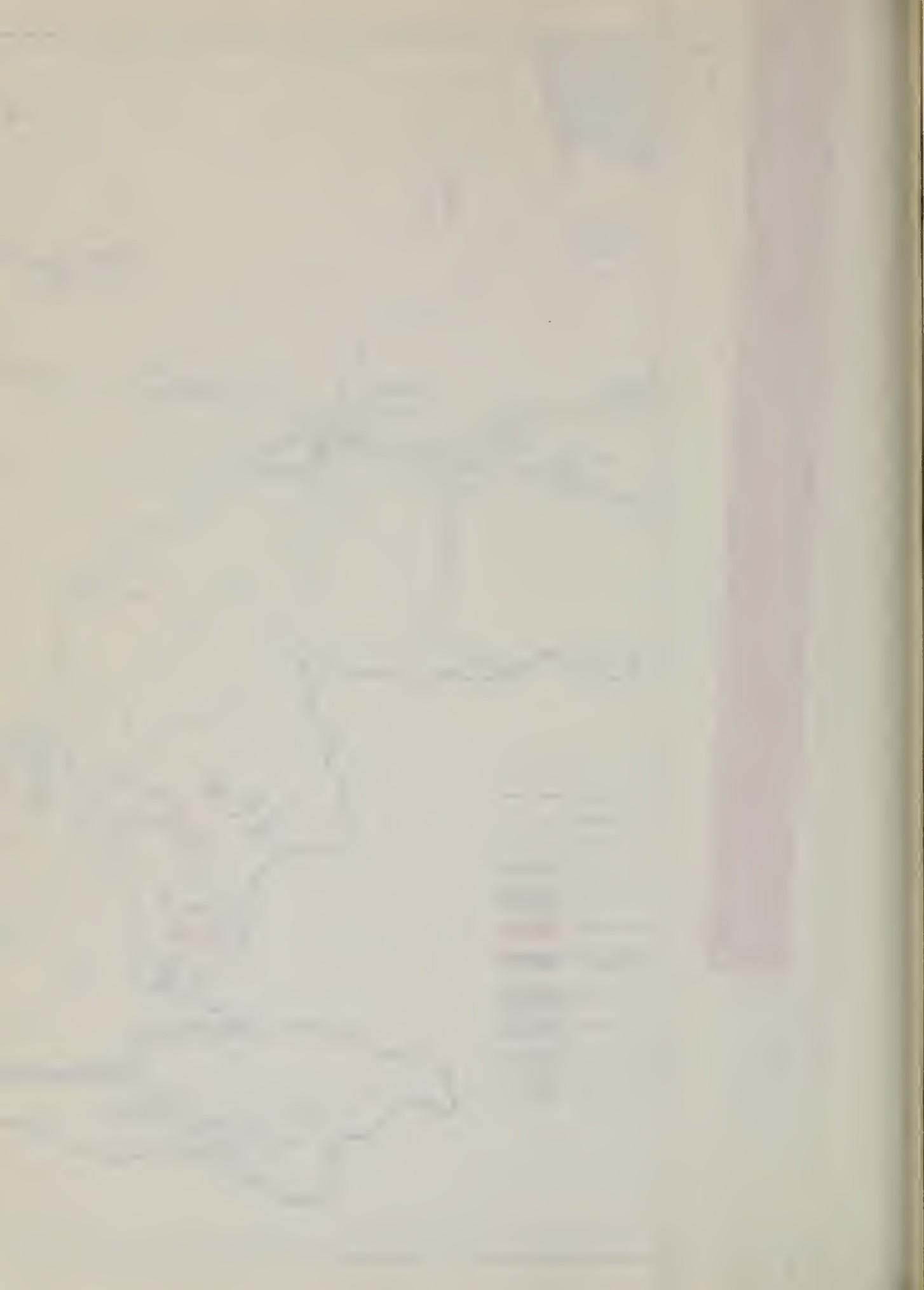
RESIDENTIAL EXPANSION
 CULTURE TO NON-IRRIGATED USE
 AGRICULTURES
 EA AND UNIT NUMBER

STATE OF CALIFORNIA
 THE RESOURCES AGENCY
 DEPARTMENT OF WATER RESOURCES
 SOUTHERN DISTRICT

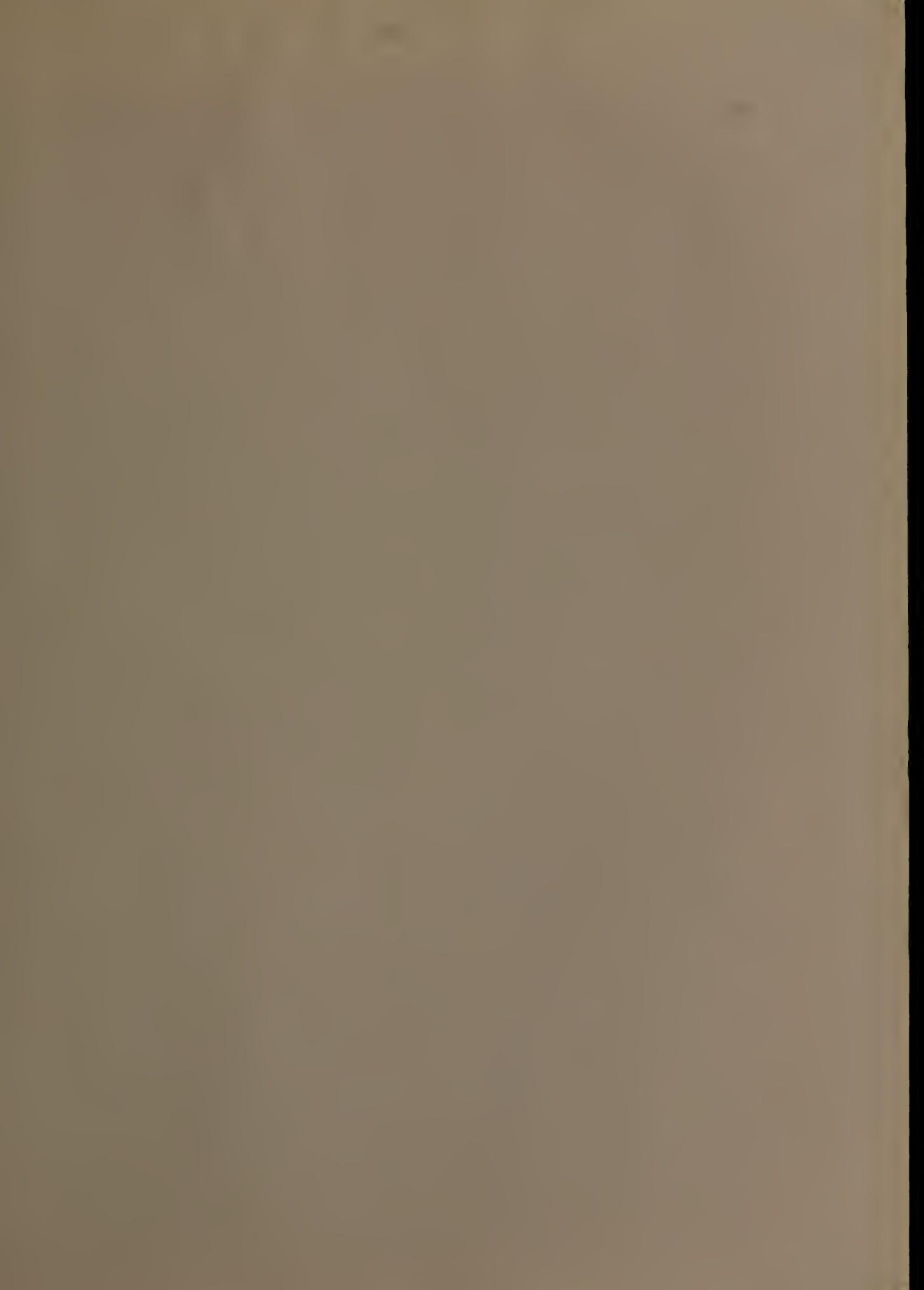
SOUTHERN LAHONTAN AREA
 LAND AND WATER USE SURVEY, 1961

CHANGE IN LAND USE
 ANTELOPE AND MOJAVE RIVER
 VALLEYS AND VICINITIES
 1957 TO 1961

SCALE OF MILES
 4 0 4 8 12
 1965







THIS BOOK IS DUE ON THE LAST DATE
STAMPED BELOW

RENEWED BOOKS ARE SUBJECT TO IMMEDIATE
RECALL

	JUN 30 1991
SEP 11 7 REC'D	RECEIVED AUG 10 1991
JUN 19 1981	PHYS SCI LIBRARY
RECEIVED	AUG 25 1981
JUN 2 1983	PHYS SCI LIBRARY
RECEIVED	JUN 11 1983
PHYS SCI LIBRARY	

LIBRARY, UNIVERSITY OF CALIFORNIA, DAVIS

Book Slip-25m-6'66(G3855s4)458

Nº 479900

California. Dept.
of Water Resources.
Bulletin.
PHYSICAL
SCIENCES
LIBRARY

TC824
C2
A2
no.121
c.2

LIBRARY
UNIVERSITY OF CALIFORNIA
DAVIS

479900

California. Dept. of
Water Resources.
Bulletin.

Call Number:

TC824
C2
A2
no.121
c.2



3 1175 00647 0564

P

S

L